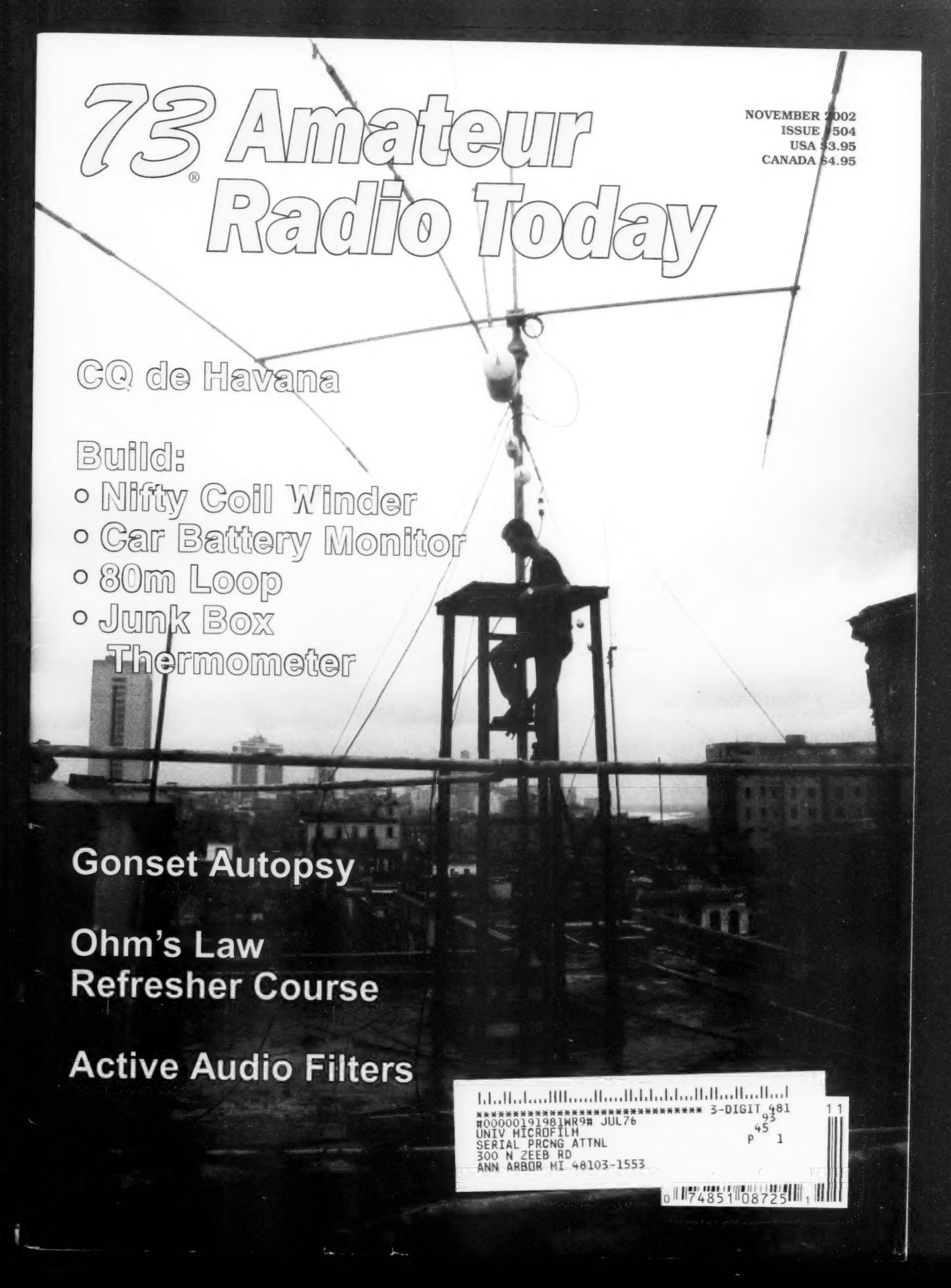

73® Amateur Radio Today

NOVEMBER 2002
ISSUE 504
USA $3.95
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CQ de Havana

Build:
- Nifty Coil Winder
- Car Battery Monitor
- 80m Loop
- Junk Box Thermometer

Gonset Autopsy

Ohm's Law Refresher Course

Active Audio Filters

********** 3-DIGIT 481
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Are You Prepared?

Every radio enthusiast should own at least one scanning receiver.

Alinco offers four great choices!

No matter what your role, if you're an emergency responder, part of the government, media, business or just an involved citizen, a multi-mode scanning receiver can keep you informed and up with current events. There's a world of communications happening all day, every day. Stay on top of developments with an Alinco scanning receiver.

Here are some of the activities you can monitor: Shortwave, commercial AM & FM broadcasts, Ham radio, police, auto racing communications, fire, security, medical, FRS, GMRS, CB, maritime, weather, news media, railways, military, aircraft control, service industries, search & rescue operations and much more!

DJ-X2000

Alinco's top of the line "Intelligent Receiver" tunes from 100 KHz ~ 2.15 GHz with excellent sensitivity and a triple conversion front end. Receives WFM, NFM, AM, USB, LSB, CW and FM stereo*, 2000 memory channels with alpha-numeric labeling, download free computer control software from the Alinco web site. Flash Tune™ locks onto and monitors strong local signals! On board "Help" feature, digital recorder, frequency counter, CTCSS search & decode, Channel Scope™ spectrum activity display, Ni-Cd battery & quick charger included. BNC antenna port with new, wide-range "ducky" antenna included.

DJ-X3

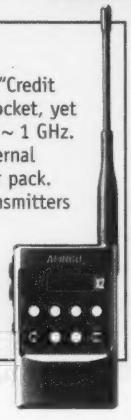
Amazing performance in a small, easily carried package! Coverage range from 100 KHz ~ 1.3 GHz with 700 memory channels. Receives WFM, FM stereo*, NFM and AM modes. Includes SMA "ducky" antenna, earphone, and internal ferrite-bar antennas for AM & shortwave. Ultra sensitive triple-conversion front end. Large illuminated display. Free downloadable control software from the Alinco web site.

DJ-X10

This high-performance receiver covers 100 KHz ~ 2 GHz, has 1200 alpha-numeric memory channels, internal "help" feature, Channel Scope™ spectrum display, receives, AM, NFM, WFM, USB, LSB and CW, triple conversion front end, superb sensitivity, BNC antenna port with wide-range "ducky" antenna and an amazing array of optional accessories. Check Alinco's web site for computer control software.

DJ-X2

Is this the world's smallest scanning receiver? "Credit Card" size is easily carried in a shirt or jacket pocket, yet it opens a world of reception, covering 522 KHz ~ 1 GHz. 700 memory channels; AM, FM, WFM modes. Internal Lithium-ion battery PLUS snap-on dry-cell power pack. Effective RF "sniffer" feature detects hidden transmitters (patent pending). Three different antenna modes including internal ferrite bar. Easy and Expert user operating profiles. Preset, memory and VFO operating modes. Illuminated display. Free computer control software available at the Alinco web site.



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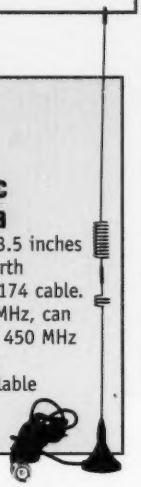
IHMM3 Magnetic Scanner Antenna

BNC connector, just 13.5 inches high. Powerful rare-earth magnet, 9 feet of RG-174 cable. Receives 100 ~ 1200 MHz, can transmit on 2m, 440~ 450 MHz and 824~ 896 cellular frequencies. Also available with Motorola style antenna connector.



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Cellular reception blocked on USA models. Unblocked versions available for qualifying agencies, documentation required.
*Optional stereo headphones required to receive FM stereo transmissions.
Specification subject to change without notice or obligation. Check local regulations before using a scanning receiver in mobile operation.

NOVEMBER 2002
ISSUE #504

73 Amateur Radio Today

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QRX . . .

Guest Editorial: 9/11 Remembered

I'm going to title this as an editorial. I'll also promise to keep it short.

We have all heard these words before: "September 11, 2001, is a day that changed all of our lives forever."

The pictures are still there in our mind's eye. The giant Boeing jets crashing into the World Trade Center. The buildings crumbling to the ground. The fire at the Pentagon. The scorched earth in Pennsylvania.

And the other scenes. The ones known only to ham radio. Those of the radio amateurs from New York, Washington, and Pennsylvania who sprang immediately into action. The hams from across America who dropped everything, grabbed their HT and traveled, sometimes thousands of miles — paying

Continued on page 6

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article [IBM (ok) or Mac (preferred) formats], carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

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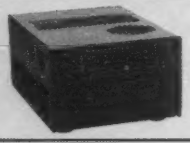
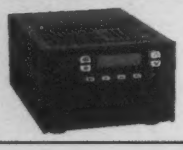


MODEL SS-10TK



MODEL SS-12IF

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
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- LOW PROFILE, LIGHT WEIGHT PACKAGE
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- MEETS FCC CLASS B

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SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ
OR 220 VAC 50/60HZ
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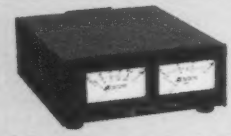
OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¼ x 7 x 9⅝	5.0



MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0

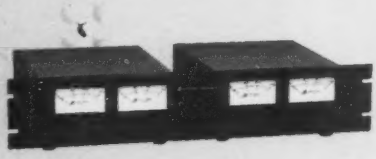
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0



MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

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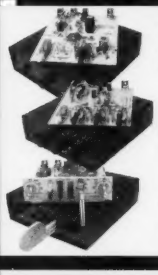


QRP TRANSMITTER
Available in 20, 30, or 40 Meters, these neat little transmitters put out 1 Watt!

HR RECEIVER
Available in 20, 30, or 40 Meters, 1.0 uV sensitivity rivals the big rigs...at a fraction of the price!

CW700 KEYER
With adjustable pitch & speed from 3-60 wpm, features true iambic keying and EPROM memory!

$99 COMPLETE!

$155 Sold Separately
Visit www.ramseykits.com/qrp to order this special deal!

$99 price includes QRP Transmitter kit, HR Receiver kit, and CW700 Micro-Memory Keyer kit, all the matching case & knob sets shown. Visit www.ramseykits.com/qrp to order this special deal!

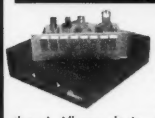
35 WATT LPFM STEREO TRANSMITTER

✓ 35W RF output, VSWR protected
✓ Automatic audio & power controls
✓ Digital synthesized PLL
✓ Full front panel control
✓ 110/220VAC, 12VDC operation

Whether your application is export or LPFM, the PX1 has you covered. From the over-rated continuous duty power supply & power amplifier to the 2 line vacuum fluorescent display, your station will be the easiest to setup and the most reliable for continuous operation. Full microprocessor controls provide a "virtual engineer". Check out www.highpowerfm for full details.

PX1	**35W Professional FM Stereo Transmitter**	**$1,795.95**

TOUCH-TONE TONE GRABBER NEW!



✓ New-built-in RJ11 phone jack
✓ Large memory holds over 500 numbers
✓ Big bold 8 digit display, auto insertion of dashes
✓ New-output latch jack

Dialed phone numbers on the radio, repeater codes, control codes, anywhere touch-tones are used, you can read and store them! All new design for 2002. Capture those tones with the TG2!

TG2	**Tone Grabber Tone Reader Kit**	**$59.95**
CTG2	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**

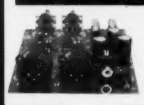
ELECTROCARDIOGRAM HEART MONITOR

✓ Visible and audible display of your heart rhythm
✓ Re-usable sensors included; just like visiting the hospital!
✓ Bright LED "beat" indicator
✓ Monitor output for oscilloscope display NEW!

Enjoy learning about the inner workings of the heart while covering the stage by stage electronic circuit theory of ECG/EKG systems. Be heart smart and learn at the same time!

ECG1	**Electrocardiogram Heart Monitor Kit**	**$34.95**
CECG	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**
ECGP10	**Replacement Reusable Probe Patches (10-Pack)**	**$7.95**

XLR TO RCA AUDIO CONVERTER NEW!



✓ Connect consumer outputs to XLR inputs
✓ Left & right audio gain adjustments

So you're trying to connect consumer audio outputs with RCA connectors (unbalanced) to XLR (balanced) inputs. Always a problem...Not anymore with the R2XL1!

R2XL1	**Unbalanced to Balanced Audio Converter Kit**	**$49.95**
CR2XL	**Matching Case & Knob Set**	**$14.95**
PWR25	**12VAC Power Adapter**	**$9.95**

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✓ Synthesized 88 to 108 MHz with no drift !
✓ Built-in mixer – 2 line inputs and one microphone input!
✓ High power module available for export use
✓ Low pass filter for great audio response

Our FM100 is used all over the world by serious hobbyists as well as churches, drive-in theaters, and schools. Frequency synthesized PLL assures drift-free operation with simple front panel frequency selection. Built-in audio mixer features LED bargraph meters to make setting audio a breeze. The kit includes metal case, whip antenna and built-in 110 volt AC power supply.

FM100	**Super-Pro FM Stereo Radio Station Kit**	**$249.95**
FM100WT	**1 Watt, Wired Export Version**	**$399.95**

SYNTHESIZED FM STEREO TRANSMITTER

✓ All new design & features for 2002!
✓ Fully adjustable RF output NEW!

Our #1 kit for years has just gotten better for 2002! Totally redesigned, the FM25B has all the features you've asked for. From variable RF output, F connector RF output jack, line input, loop output, and more. Includes case, power supply, whip antenna, audio cables.

FM25B	**Synthesized FM Stereo Transmitter Kit**	**$129.95**

AUTOMATIC COLOR/BW IR CAMERA

✓ Color during the day, IR B&W at night!
✓ Automatically turns on IR Illumination!
✓ Waterproof to IP57 standards!
✓ Black anodized housing with universal mount NEW!

Best of both worlds! This video camera is a waterproof COLOR camera during the day. When the light level drops, it automatically changes to B&W and turns on its built-in IR illumination, with 10 IR LEDs. Powered by 12VDC and terminated with a professional BNC connector. B&W only model also available if color is not needed. Both in heavy anodized black housing.

CCD309	**Color/B&W IR Waterproof Bullet Camera**	**$169.95**
CCD308	**B&W IR Waterproof Bullet Camera**	**$109.95**
AC125	**110 VAC Power Adapter**	**$9.95**

MINI B&W CAMERA WITH IR ILLUMINATION

✓ Built in IR illumination!
✓ Sees in total darkness! NEW!

What a deal! This miniature B&W video camera has 6 high power IR LEDs built into it to provide illumination in total darkness! No need for external IR illuminators. Attractive black aluminum housing easily mounts at any angle with the built-in swivel bracket. Runs on 12VDC, and includes professional BNC output plug-in harness.

CCD303	**Mini B&W IR Illuminated Camera**	**$59.95**
AC125	**110 VAC Power Adapter**	**$9.95**

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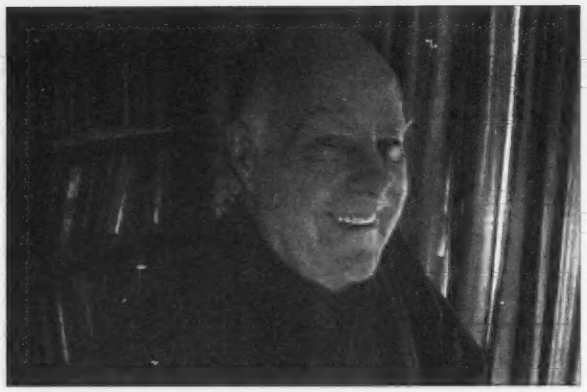

Wise Up & Beat the Odds

NEVER SAY DIE

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After hearing Mark Hazelwood on the Art Bell Show talking about Planet X arriving next year and raising hob, it took a while, but I finally managed to get a copy of his book, *Blindsided*. As I explained last month, Mark makes a very good case, complete with the details of world catastrophe predictions from 16 noted psychics.

Since the book had been so difficult to get, I called the publisher and ordered a stock of them. Now you can get a copy from Radio Bookshop for $15 (item #94). Will the world as we know it come to an end next May? I'm not making any plans … not because I'm discounting the prediction, but because I have so much going on that depend on things not being catastrastroked.

However, what'll it hurt if you make sure you've got some reliable QRP equipment and a way to generate power? I like the idea of the micro-generators using old house fans. Read Tom Miller's great Microwind article in the December 2001 issue.

Me? Why think small? All I want to do is totally revolutionize our educational system … which I plan to do with a publication as soon as I have a million to get it going. I want to put the NEA and our current public school system out of business. But then, I also want to put the present food industry out of business, including the agricultural giants and the sugar industry. Oh, and the pharmaceutical industry and their AMA puppets. Plus the nursing home and assisted living industry. And about 75% of our hospitals. Plus, too, the oil, coal, and natural gas industries.

I see the best route to world peace through business and education. Using modern technology we can cut the cost of education by about 80% to 90%, making it affordable to the whole world. And by emphasizing the development of entrepreneurial businesses and the downplaying of international corporate giants, we'll see a better distribution of wealth … and a lot less poverty.

Go ahead and laugh at me as a dreamer. Hey, I got bigger laughs back in 1970 when I predicted that the handful of repeaters we had then would eventually be a technology that everyone would be using. So I started a repeater journal, published hundreds of repeater-oriented articles in *73*, ran repeater conferences, and organized a special hearing with the FCC commissioners which resulted in major rules changes. The end result are the cell telephones we see everywhere in the world today.

When the first microcomputer came along I got one. Wow! So I started publishing computer magazines such as *Byte, Microcomputing, InCider, Run*, etc., to help the innovators communicate their ideas, to attract newcomers to the field and bring them up to speed, and to provide a medium with which entrepreneurs like Steve Jobs and Bill Gates could reach potential customers with their products.

Right now I'm having a ball publishing *NH ToDo*, with the major goal of doubling New Hampshire's tourist industry and thus making sure that we're not going to be affected by any recessions. My other goal is to get as many people as possible off their duffs and out having fun. I want to get 'em up into hot air balloons, into gliders, climbing mountains, scuba diving lakes, water skiing, snow skiing, kayaking, and so on.

I didn't learn to ski until I was 44, and now I love it! I usually ski with a group of hams, all of us keeping in touch with our HTs as we zoom down the slopes.

It's easy to learn to ski. I started out with a pair of short-short skis (2.5-feet long) and after four days of lessons I was charging down the local slopes without falling down. I then bought five-foot skis, and after a week of lessons I was skiing better than I ever thought I would in my life, even on the black diamond trails.

A sample copy of *NH ToDo* is $3 from Radio Bookshop, if you want to see what I've been doing. This is a magazine that needs to be cloned in every state, and even in most of the larger cities. We need to pry people away from brain-free TV crapola. We need to get families out camping, picnicking, going to county fairs, and having fun. Parents have a responsibility to give their kids memories that they will never forget. You'll never forget your first hot air balloon ride. Or exploring a cave. Or mountain climbing.

I'd sure like to see more hidden transmitter hunts where the hunters go out on foot rather than drive their cars. It's great fun organizing a hunt … particularly if you have a fiendish turn of mind (like I do).

You say you're too old to ski? Baloney! Well, then, how about getting some snowboard lessons. They call that "Grays on Trays."

Health (Again)

None of all this is any fun if you're not in good health … which is why I've been doing so much research in that field. I've reprinted a bunch of my essays on the subject in my *Secret Guide To Health*. It's $10 (#04) from Radio Bookshop. With our Department of Health telling us that only 1.5% of Americans are truly healthy, maybe it's about time to stop listening to "real" doctors (who only make money when you are sick) and start reading some of the books with the facts.

Are you still drinking tap water? Cheesh, what's it take to get the message through? In my *Secret Guide to Wisdom*, I have a review of Dr. Banik's book (p. 15). Dr. Allen E. Banik, M. D., who spent much of his life researching the effects of water on the human body, reported the following in his publication *The Choice Is Clear*: "The only minerals that the body can utilize are the organic minerals. All other types of minerals are foreign substances to the body and must be eliminated. Distilled water

Continued on page 40

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QRX . . .

continued from page 1

their own way — to become the second, third, and fourth wave of relief operators and volunteers.

No, ham radio was not on the front page of newspapers. Hams were not the lead story on the evening news. The tragedy of 9/11 was the story. The job of ham radio was to be the carrier of the message so that aid and comfort could be brought to the victims of this horrific and cowardly act of terrorism.

What 9/11 showed is that our loose-knit fraternity can come together when the need arises. That we may be called radio amateurs, but that we are communications professionals. That ham radio is there when it is needed.

On 9/11, ham radio did the job its people have trained themselves to do. The hobby has since moved on. So has our nation. But neither will ever be the same.

We pray that a tragedy like 911 never happens again.

Thanks to author Bill Pasternak WA6ITF, editor of and via Newsline.

A New Kind of Battery

One of the most frustrating experiences for a photographer or a ham radio operator is to be in an acute situation that requires equipment to work properly and have the batteries powering the equipment go flat. For the photographer, it usually means a lost photo opportunity. To the ham radio operator assigned to provide communications during an emergency, it could be a life-and-death situation.

But power reliability could soon increase dramatically. Steve Crow K4CPX passes along word that the nation's largest photographic retailer, Ritz Camera, has announced plans to begin selling a new battery that can keep a camcorder or digital camera shooting away for half a day.

The new source of portable power is Electric Fuel Corp.'s Instant Power disposable batteries. Based upon Electric Fuel's zinc-air technology platform, the Instant Power camcorder battery connects to the camcorder through its DC jack and offers the user up to 10 hours of running time. Another model designed for digital still cameras offers upward of 12 hours of continuous operation time. As with the camcorder battery, the digital camera battery pack comes with a built-in belt clip and 3-foot cord. Both batteries have a five-year shelf life in the original sealed aluminum pouch and come complete with a 3-foot cord and an integral belt clip.

While not directly designed for ham radio needs and not a renewable source, the new battery could augment the needs of ham radio operators in emergency communications situations. And here's where amateur radio ingenuity comes in. If models are available that can directly, or through some home-built regulator adapter, be made to power a 5 watt hand-held radio, an amateur working an emergency situation would have hours of power well beyond that of his radio's normal battery. And depending on how much he transmits, an Electric Fuel battery might run his HT for several days before requiring replacement. This also gives the possibility of extended operations for low power Field Day stations, QRP treks, and similar one-time operations. Best of all, it is a date it, put it on the shelf, and forget it power source, standing by for the next five years in case it is needed.

Electric Fuel also manufactures a smaller version of this battery technology for cellular phones and PDAs. You can find out more about this new power source and the technology behind it on the Web at [www.electric-fuel.com].

Thanks to K4CPX and Henry Feinberg K2SSQ, via Newsline, *Bill Pasternak WA6ITF, editor.*

Boom in Toothpaste Sales Predicted

Donnie Osmond, the former KA7EVD, is helping to bring a legendary television game show back to the small screen. Osmond is host of *Pyramid*, a syndicated revival of the game shows created and hosted by Dick Clark in the 1970s and '80s.

According to Los Angeles ham radio lore, Osmond was reportedly mentored into ham radio in the early 1980s by the late Art Gentry W6MEP. This, when Osmond and his sister were taping the *Donnie and Marie Show* at the Golden West Studios in Hollywood. Gentry, who was employed there as a broadcast engineer, is best known for his development of the FM repeater — a device that changed the way most hams operate on the VHF and UHF Amateur Radio Service bands. He and his wife Millie K6JJN, were also mentors to many Los Angeles youngsters wanting to enter ham radio.

Thanks to USA Today, *via* Newsline, *Bill Pasternak WA6ITF, editor.*

Frequency — the TV Show

New Line Cinema is considering spinning off the movie *Frequency* into a TV series. This is the film in which the nonham hero uses his dad's old ham radio equipment to communicate with his now-deceased father.

The movie was a great public relations boon for amateur radio. If New Line Cinema proceeds, a TV show could help put the words "ham radio" in the mind of every man, woman, and child in the US of A.

Thanks to W6AQ, via Newsline, *Bill Pasternak WA6ITF, editor.*

History of MARS

The Military Affiliated Radio System (MARS) has provided an inexpensive link for U.S. service personnel stationed abroad. MARS operators in the states have provided telephone "patches" for decades. MARS stations in the Vietnam combat zone allowed our military there to have access to HF long distance capability for staying in touch with their families back in "The World."

The U.S. Marine Corps Historical Division is seeking input from both military and civilians who served as part of the MARS program through arranging phone patches or relaying MARSgrams. Both oral and written accounts are welcome.

The main focus is on Navy/Marine Corps MARS during the Vietnam era, but all contributions from all services and eras are solicited. Artifacts such as photos of stations and personnel also are being collected for an exhibit. Those who would like to contribute should E-mail [MARS@borgmangroup.com] or write Borgman Group, 3342 South Sandhill Rd., Suite 9-326, Las Vegas NV 89121.

Thanks to the North Florida ARS Balanced Modulator, *Sept.-Oct. 2002.*

A Battery Can Become a Time Bomb

Jump-starting a battery is a common procedure, but never take this job for granted or you could be seriously injured.

A battery can turn into a bomb while it is being boosted. A lead acid, wet cell battery generates increased hydrogen and oxygen when it is being charged. All it takes to set off this explosive combination is a spark from static electricity, a cigarette, or the booster cable connection itself.

Here's how to correctly boost a battery:

- Always wear safety goggles to protect yourself from acid and fragments in case of an explosion. It's a good idea to store safety goggles with your jumper cables.
- Check to see if the battery is really dead, or if the terminals and clamps might just be corroded.
- Restore correct fluid levels to the battery. If you are dealing with the more recent sealed type of batteries, it is not always possible to restore these fluid levels. If this is the case, the battery should be replaced.
- Make sure the battery is not frozen. Trying to jump a frozen battery could result in an explosion.
- The electrical systems of both vehicles must be the same voltage and both must have a negative ground. Mismatched batteries are less likely than they were 20 years ago, but six-volt batteries are still in use today. Using a 12-volt battery to boost a six-volt battery could cause the six-volt battery to explode.
- Park the vehicles close together, but not

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touching. Put both vehicles in "park" or in "neutral," with parking brakes set.

• Turn off the engine and any electrical accessories, including interior lights on both vehicles.

• Remove the battery vent caps to allow any previously built-up gas to escape, then cover the holes with a damp rag or replace the caps.

• Do not lean over the battery at any time.

• Connect the red clamps to the positive "+" posts of each battery. Reverse connection causes a battery explosion hazard.

• Connect one black clamp to the negative "-" terminal of the good battery.

• Connect the other black clamp to a good ground: a clean, unpainted spot on the engine, frame, or body of the disabled vehicle, placing it as far away as possible from the battery. This will prevent sparks from occurring in the vicinity of any explosive gases.

• When connecting the clamps, do not allow them to touch any other metal. This would not only cause a spark which could trigger an explosion, but it could destroy parts of the vehicle's electrical and computer system.

• Start the vehicle with the good battery.

• Start the disabled vehicle.

• Remove the cables in reverse order.

• Detach the "-" cable first from the disabled car's frame.

• Then take the "-" off the good car's negative terminal.

• Remove the disabled car's "+".

• Then remove the live car's "+" connection.

Other tips:

• Avoid any sparks or open flame. This means no smoking.

• Additional PPE (personal protective equipment) such as a face shield, rubber boots, or special rubber gloves may be required under various circumstances.

• Check battery fluid regularly, and keep terminals and clamps free of corrosion. Make sure your battery is in good condition for cold weather driving, when a weak battery may prove inadequate for starting your vehicle.

• Some of the causes of dead batteries are obvious, such as leaving your lights on. But if you are not sure, take your car to a garage and find out what caused it to go dead in the first place.

Hopefully you won't have to boost any batteries soon, but if you do, follow these guidelines to prevent an explosion. And one more thing: Make a copy of this page and put it in the glove compartment — just in case an inexperienced driver in the family runs into trouble.

Thanks to Radio Flyer, *the U*BE*T ARC newsletter, Nov. 1997.*

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LETTERS

From the Ham Shack

Parker Cope W2GOM/7, Prescott Valley AZ. The article "This Thing Called Wire-Wrap" (August 2002) missed a few points: how many turns are needed, how much wire needs to be stripped, and how the turns are put on the post.

The answers in reverse order are: The unstripped (insulated) part of the wire is held next to the post, the bare wire is fed up through the wrap barrel, the barrel of the tool is placed over the post, and the tool rotated around the post. When all of the bare wire is wound on the post, the tool can be removed, leaving the wrapped bare wire on the post.

The length of wire for one turn on a 0.025-inch post is about 1/8 of an inch. Therefore, for three turns, 3/8 of an inch is enough, a half inch is more than enough.

Three turns are all that are needed to make a gas-tight connection, but I shoot for four turns. Five turns aren't too bad either.

I've known techs to touch the wrap with solder after everything is checked out, but that is overkill. The phone company has millions of wire-wrap connections of just wire-wrapped on the post and no solder. They don't have any problems. Wire-wrapping is the way to go.

Gordon West WB6NOA, Costa Mesa CA. Steve Nowak's "Top Secret" column ("On the Go," June, page 39) was right on target. The June issue of *73 Magazine* reconfirms my dedication to amateur radio and emergency preparedness, as well as my frustration with those organizations and individuals who specialize in nit-picking new ideas to help our amateur service grow and become a larger part of the emergency communications response.

Bill Pasternak did a great job in summarizing some of Wayne's gripes about "not invented here" when it comes to the American Radio Relay League. They truly do not open themselves up for suggestions, new ideas, or working with the troops down in the trenches.

Here's a case in point that coincides with topic (B) in Steve Nowak's "On the Go" column, where he says "... have a positive attitude ... most hams were quick to offer help ... one, though, launched a dissertation as to why this would be illegal since it supported the hospital's business ...":

I had the exact same thing happen to me and our city volunteer communications group when our ATV disaster preparedness activities became well known throughout Southern California. Our local ARRL director responded precisely with the (B) statement ... "since it supported the ... business of ..." Like you, I don't think any emergency group has a "normal business" that would include disaster or an attack.

But our director goes further to write in his local newsletter: "... in our zeal to provide emergency/disaster relief communications, let's not lose sight of the true nature of amateur radio as a volunteer, noncommercial service free of pecuniary interests for the benefit of ourselves or our employers. We head down a slippery slope when we subvert the carefully crafted rules in Part 97 to accommodate Part 74 or Part 90 operation, such as public safety airborne video, in the amateur bands ..."

The ham radio pilots who fly our local public safety helicopter don't get any pay for sending down voluntary ATV communications, nor are these paid pilots possessing a valid ham license using onboard ham TV for ANYTHING other than transmitting directly to our ham volunteer group on the ground. They can monitor their own ATV transmit frequency before transmitting, they have ATV 2-meter liaison frequency capability, they ID two different ways almost continuously, they transmit only to a volunteer ham station on the ground when asked to, and their volunteer ATV activities in no way earn our local city any money that might violate "pecuniary interest" rules.

The local Southern California ATVers are all very positive about our program because we are rapidly creating more ATVers on the ground who regularly check into their repeater nets. The local ATVers in Southern California are in full support of our disaster preparedness drills that might last a whopping 5 minutes a week on ATV simplex 426.250 MHz. Their only disappointment is not being able to see the picture more than 20 miles away simplex, and the rather shaky picture when we try to squawk through an ATV 1.2 GHz cross-band repeater thousands of feet higher than our local police helicopter.

Until we developed our ATV program with our local city communications division, there wasn't much that our local ham radio volunteers might offer that the city did not already have. In other words, before our ATV efforts, our local city had little for us to do that would work into their emergency preparedness plan. Yikes — if a local ham radio group gets an official position on a city emergency preparedness plan, does this mean we are again violating the rules? Are we facilitating the normal business of that city by being part of the emergency preparedness plan? Should we only offer our voluntary services to ONLY voluntary groups where no one in that group gets paid a salary, or certainly no ham as part of that group gets some scoots?

Does this indeed mean that the well-respected local hospital disaster communications group may also be subverting the rules by giving their local hospital backup communications in case of a phone outage or nearby disaster? Maybe so, and there are probably thousands of ham radio emergency operators who may be "guilty" of getting in close with local emergency agencies to help provide backup communications.

Gosh, does ARRL President Jim Haynie want to rethink his encouragement for hams to work in the homeland security efforts?

As the *ARRL Rule Book* so clearly indicates, it's up to the emergency communicators to decide for themselves where the line is drawn between "facilitating the regular business of" and providing emergency comms to a local city, county, or state emergency service. The *ARRL Rule Book* illustrates some of the questions asked about cooperating with the National Weather Service and providing storm spotting and strategic weather reports for them from the field. Oh, my gosh — are we subverting the rules again here?

Like you, I don't think so. It's time for those hams sitting on the sidelines or up on a pedestal acting as radio cops themselves to get down here "in the trenches" and see what it's like to work closely with a municipality that will indeed use our services when disaster strikes. That's a relationship I think that all hams are trying to promote so that we may be of SERVICE during times of emergency, rather than a bunch of untrained "wannabes" standing around with nothing more than an HT and a battery pack that might last for two hours.

All we need to do is take out the *ARRL FCC Rule Book* and look at the basis and purpose of our Amateur Radio Service, Part 97.1(A): "Recognition and Enhancement of the Value of the Amateur Service to the Public as a Voluntary Non-Commercial

Continued on page 58

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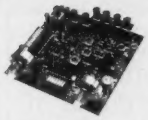

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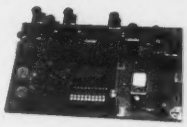

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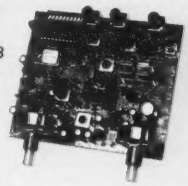

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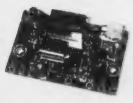

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Your Turn for a Coil Winder

The Gingery Universal Coil Winder can be an easy — and handy — addition to your bench.

My 1942 Radio Master Catalog shows that for the sum of $4.35 — about a day's average wage at the time — you could buy a Morris Deluxe Coil Winder. According to the advertising copy, you could wind honeycomb, spider web, and solenoid coils equal in appearance to factory-made coils with this marvelous tabletop machine.

Unfortunately, the Morris Coil Winder and its competitors are now found only at antique radio auctions. But, David Gingery has rescued those of us who enjoy winding our own coils. His 24-page booklet, *Build a Universal Coil Winding Machine*, provides a step-by-step illustrated guide that enables anyone with even modest metalworking skills to construct his own coil winder. Gingery writes with a simple, direct style and every part is illustrated with clear, dimensioned drawings. Gingery assumes that the reader possesses only moderate skill and provides detailed fabrication and assembly instructions.

I'll take you through my construction of his design, including some modifications that I believe improve his design.

How it works

Place a hollow tube coil form on the threaded spindle (9; see **Photo B**) and tighten the conical mandrels to hold it in place. Put a spool of magnet wire on the wire holder (8), thread the wire under the spindle, over the top of the wire guide and attach it to the coil form with a bit of tape or glue.

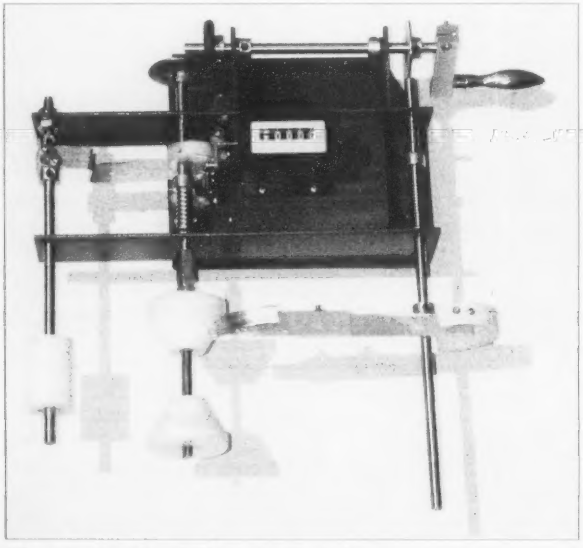

Photo A. *Completed Gingery coil winder.*

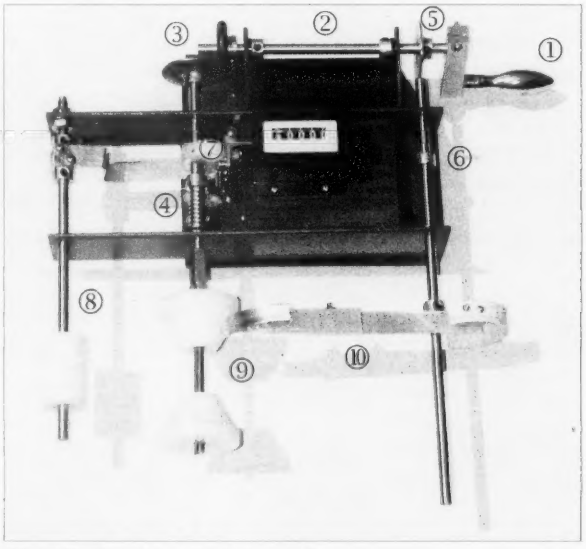

Photo B. *How the coil winder works.*

Turning the crank (1) revolves the drive shaft (2), which in turn drives the spindle through the rubber tire and disk mechanism (3), causing the coil form to revolve and take up the magnet wire. Disk mechanism (3) is held against the rubber tire by spring (4). Simultaneously, cam (5) causes cam follower rod (6) to oscillate back and forth. The wire guide (10) tracks the movement of the cam follower rod (6), thereby causing the wire to follow a universal winding path on the coil form.

With every revolution of the spindle (9), cam (7) trips a lever that advances the digital counter, thereby displaying the number of turns wound on the coil.

It's also possible to guide the wire by hand for close-wound or space-wound solenoid coils.

For anyone unfamiliar with what a "universal wound" coil is, look at the ubiquitous 2.5 mH radio frequency choke. A single turn of wire is wound at an angle to the inductor axis, with additional turns wound on top of each other. This introduces space between adjacent turns, thereby reducing self-capacitance and increasing the frequency at which the choke is self-resonant. Each section in the 2.5 mH choke is "universally wound."

Necessary tools and parts

The author says that the coil winder can be built with only an electric drill and common hand tools, such as a hacksaw and propane torch, and that a drill press and lathe will be helpful, but not necessary. I used a metal cutting band saw, milling/drilling machine, and a lathe, and found that these tools speeded up the project and allowed me to make a more finished appearing project. Although it might be possible to build the coil winder without a drill press, I wouldn't recommend it for anyone with below average metal-working skills. If you don't have access to a metal cutting band saw, stop by the hardware store and pick up a couple fresh blades for your hacksaw.

All the parts described by Gingery are readily available, and most can be found at a well-stocked hardware store. I found that some parts, such as the 1/4-inch shaft collars and fender washers, were much cheaper to order in quantity from an industrial supply house. The "extras" that I added, such as a more professional counter and the revolving handle, will likely be available only from an industrial supply house. (See Notes for a possible supplier.) The only slightly unusual part required in Gingery's design is a rubber tire from a sewing machine bobbin rewinder. A quick trip to the local sewing machine repair store quickly provided one for a buck.

It's critical that the various rotating and oscillating shafts be straight, smooth, and held to a tight diameter tolerance. Quarter-inch-diameter drill rod is a good inexpensive choice. Standard hot rolled or cold rolled rods of the type found at most hardware stores are likely to be unsatisfactory. Likewise, it's essential that the holes through which the rod fits be round, smooth, and very close to — but not under — 0.250 inch in diameter. It's almost impossible to assure these criteria with a simple twist drill, so I drilled the bearing holes with a 1/4-inch twist drill, and followed up with a 0.252-inch chucking reamer. A reamer leaves the hole round and smooth, and the extra 0.002-inch diameter provides enough clearance for easy operation without a sloppy fit. This is an expensive tool, nearly $20, so you might wish to consider alternatives, such as very careful work with a smooth round file.

Construction and changes

I decided to use an inexpensive mechanical counter instead of the hand tally counter used in the stock design. To accommodate the larger mechanical counter, I increased the spacing between the cam follower rod and the spindle by 1 inch. This increase carries through in the base and the drive shaft lengths.

Gingery suggests that base be made from 3/4-inch-thick wood. Since it's important that the base plate surface be flat, I used a piece of 3/4 inch medium density fiberboard (MDF). Over the space of a few inches, MDF is remarkably flat; I measured flatness variations of only 0.001 inch in my base plate, much superior to either raw

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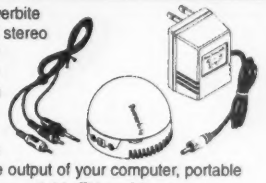

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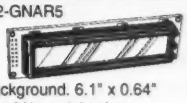

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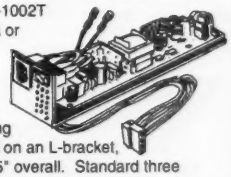

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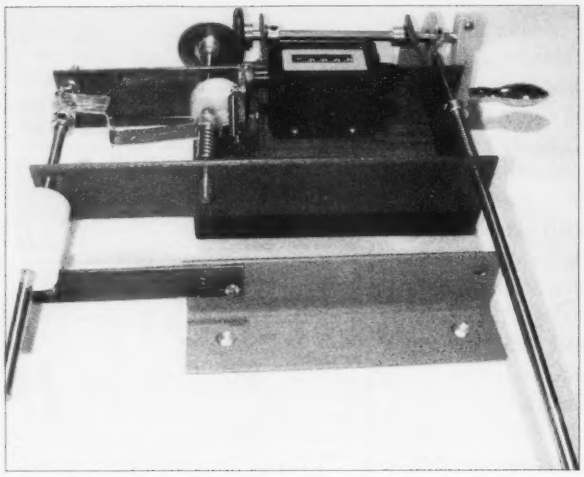

Photo C. *I didn't use the strap extensions proposed by Gingery.*

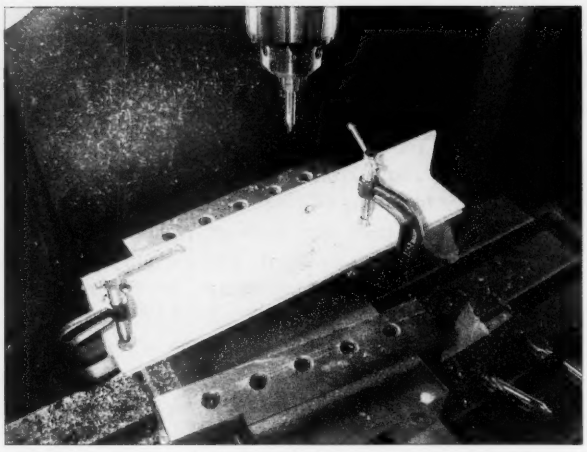

Photo D. *To ensure the bearing holes are aligned, clamp the two pieces of angle together and drill simultaneously.*

plywood or other wood products. MDF's dimensional accuracy and stability aid the overall accuracy of the completed project.

In Gingery's design, components are attached to the base plate with no. 8 x 3/4-inch wood screws. Since I knew that I would be assembling and disassembling the winder as I tinkered with my modifications, I substituted threaded inserts commonly used in furniture work. This enables the components to be held in place with 10-24 flat head or button head machine screws. To help retain the threaded inserts in the MDF, I filled the hole with epoxy after screwing in the insert.

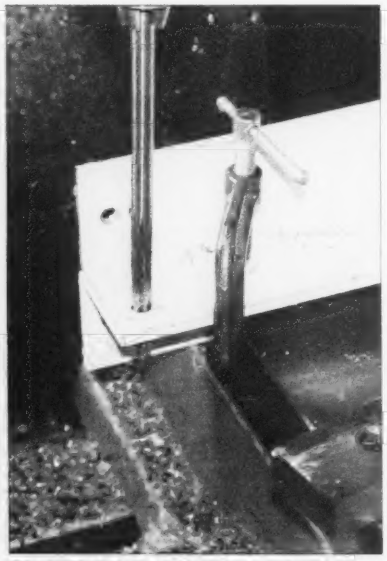

Photo E. *After drilling the bearing holes, I reamed them with a 0.252-inch reamer.*

The main body of the winder is made from 1-1/2-inch steel angle. Gingery shows the wire holder shaft supported by an extension made from 3/4 x 1/8-inch flat iron, secured with a single 8-32 screw. The extension strap is prevented from rotating by the spindle rod. I made the winder body and extension following Gingery's details and found it didn't work. The extension support strap rotated and bound the spindle, preventing it from rotating. A single 8-32 screw did not provide enough friction to prevent rotation and caused a "guillotine" effect against the spindle, even with only a small roll of magnet wire on the support.

I revised his design by substituting a single piece of 1-1/2 angle. To preserve Gingery's concept, I cut one leg of the angle out. **Photo C** shows Gingery's original design and my revised approach. If you don't have a metal band saw it isn't necessary to cut out the angle leg. In this case, I would consider extending the base plate to run the total length of the steel angle.

I used black hot rolled angle from the hardware store. I recommend scrubbing off the oil and loose scale with a wire brush and solvent, followed by a coat of a light color metal primer, so that you can accurately mark out the work before doing any drilling.

Since it's critical to align the bearing holes, I clamped the two main angle pieces together and simultaneously drilled the holes. I cleaned up each pair of holes with the 0.252-inch reamer immediately after drilling.

Gingery suggests that the cams and drive disk be made by brazing shaft collars to fender washers. I found that soft solder worked well, as long as the joint was cleaned and fluxed. Don't use rosin core electrical solder here; this calls for the stuff you find in the plumbing department!

Another weak part of Gingery's design is the friction drive mechanism. His booklet shows the friction between the rubber tire and the drive disk regulated only by the degree of compression of the rubber tire. Although it worked when I built it, I found it difficult to get exactly the right degree of compression. This mechanism also makes adjusting the drive ratio unduly complicated Accordingly, I added a stiff compression spring and shaft collar so that the spring sets the drive friction. If you are not going to use the winder for an extended period, release the spring tension. At the bearing end of the spring, I added a sandwich of two stainless steel washers and a nylon washer to stop the spring from chewing into the angle. **Photo F** shows the revised drive assembly.

I also added nylon washers to the two shaft collars that bear against the angle. The rough iron would otherwise

provide a poor friction bearing against the smooth shaft collar.

My decision to use a different mechanical counter also required changes in the lever, cam, and counter mounting portions of Gingery's design. I had a small block of *lignum vitae* left over from another project and used it to make a mounting block for the counter. *Lignum vitae,* although wood, can be milled and tapped almost as if it were metal. I milled the block to fit the space between the two angles and milled the top and bottom parallel and flat. It is held in place by two aluminum angle brackets. The activation cam follower is made from a piece of 1/2-inch-wide aluminum, 0.050 inch thick, bent to fit. The activation cam is a small length of 1-inch Delrin® round stock, drilled approximately 1/4 inch off-center and drilled and tapped for two 4-40 set screws. The cam follower pulls the spring supplied with the counter. It's not good design practice to directly press upon the activation arm, as a jam could damage the mechanism. Pulling the spring limits the force that can be applied to the counter to a safe limit.

Gingery's plans call for the wire guide to be made from a series of folded sheet metal structures. I had serious difficulty making the required creases and bends, so I instead used a combination of aluminum angle and plastic pipe. I started with 1 inch x 1/8-inch-thick aluminum angle and milled it to the particular leg dimensions shown in Gingery's design. Gingery assumes that the wire guide will be made of a solderable material, and fortunately I was able to use special aluminum solder where soldering was required.

The wire guide has two semicircular sections at its nose and tail. I was able to make the nose section from a thin piece of brass following Gingery's instructions, although it isn't the most attractive piece of metalworking that I've ever built. I completely failed making the larger tailpiece. My substitute was a small section of 1-1/2-inch PVC pipe, with a shallow groove that I turned in the lathe with a 60-degree threading tool. I then made a support

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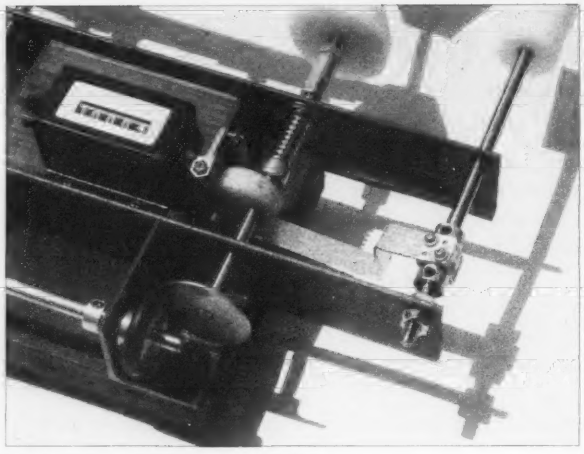

Photo F. *Revised drive tire and disk.*

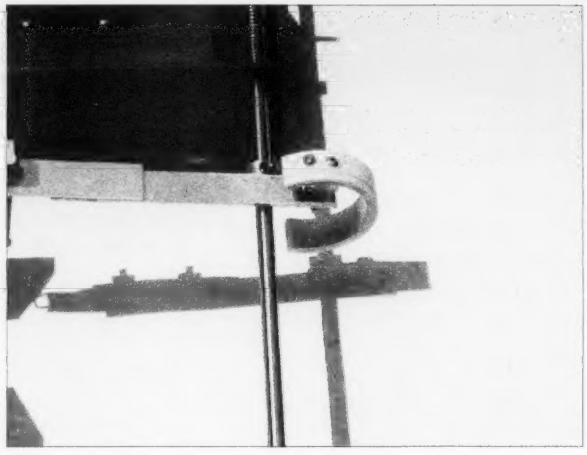

Photo G. *Revised wire guide.*

piece from a length of 1/2-inch-square aluminum bar stock. It's important that the wire guide groove not damage the wire insulation, so I sanded it with fine grit sandpaper.

Using a 1/4-inch support rod for wire spools with a 1-inch inner core diameter caused erratic drag. To correct this, I made an accessory wire spool holder from a short length of 1-inch Delrin round stock.

I made two sets of mandrel cones, one for small coils with 1-inch diameter Delrin, and one from 2-inch diameter Delrin for larger coils. It is necessary to thread the cones for the 1/4-20 spindle. Most 1/4-20 taps are too short to completely thread all the way through the larger cone, so I used an undercut tap. If you don't have a lathe, don't worry; Gingery provides an alternative cone construction technique.

The final special touch I added to the coil winder was a revolving handle, attached to the drive shaft with a short section of 1/2-inch aluminum bar. Since the handle must be removed to change cams, I used a split cotter, clamped with a 4-40 screw, to secure the aluminum bar to the drive shaft.

Winding coils with the coil winder

After cleaning, priming, and final painting, I reassembled the coil winder and wound a few test coils. Gingery provides a brief description of operation and offers a couple suggestions for coil winding. I found this an area where additional information would be beneficial.

I started with a paper tube, formed from several layers of standard typing paper, glued together and wound on top of a small length of 1/2-inch-diameter steel rod. After the glue set, I slipped the form off the rod. To secure the ends of the winding, I punched small holes through the tube at either end.

I then secured the paper tube coil form between the two smaller cones, threaded my no. 34 A.W.G. enameled magnet wire through the wire guide and started to crank the handle. After three or four turns, I had a mess. The wire slid back and forth over the smooth paper core and wouldn't take the side-to-side form — there wasn't enough friction between the slick enameled wire and the smooth paper core. I tried an old trick of dissolving a block of musician's rosin in denatured alcohol and painted the sticky mixture on the core and allowed it to dry a bit. Success! The rosin-coated core

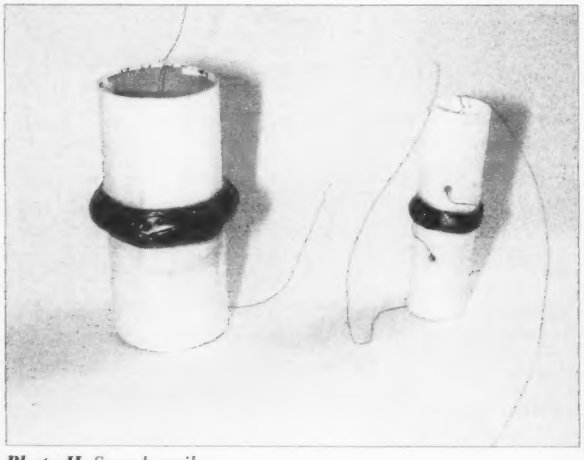

Photo H. *Sample coils.*

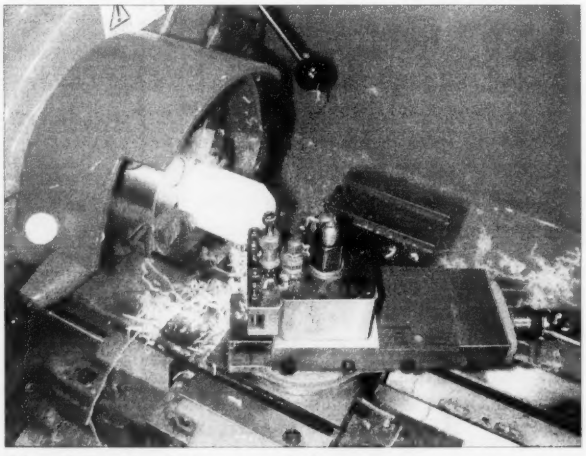

Photo I. *Turning the large mandrel cones.*

gripped the enameled wire and the proper universal shape started to appear after a dozen or so turns of the crank. At this point, the enameled wire's slipperiness reasserted itself and the lack of turn-to-turn friction became a problem. I wound up painting the coil every ten turns or so with more of my rosin/alcohol mixture. After winding a coil, I allowed the rosin mixture to set up and then painted the coil with Q-dope. The result was a sort-of-OK coil. You would never mistake it for a professionally wound coil, but I believe that a bit of practice and experimentation with the ratio between coil revolution and guide oscillation, wire drag, and wire guide position should help.

If you use rosin-alcohol mixture, keep it away from the wire guides, as these must remain smooth and friction free. I didn't appreciate this at first and had to scrub off stray rosin droplets from my wire guides with denatured alcohol. Even a small bit of rosin in the wire guide caused enough excess friction to break the small gauge wire after a turn or two.

I also tried another trick from the early days of radio — beeswax. A trip to the local arts and crafts store yielded a lump of beeswax and a package of wood "Popsicle sticks." I scraped a small piece of beeswax onto one of the wood sticks and softened it with a few seconds blast from a heat gun. I then coated the paper core with a thin layer of softened beeswax and added more wax every few turns. When the coil was finished, I melted more beeswax onto the outer layers. I also experimented with a soft wax product called "Florist's wax" or "Florist's adhesive" that can be applied without heating. The chief drawback of the soft wax is that it never sets up and thus quickly picks up dirt. Either of these is less messy than my rosin/alcohol mixture.

Gingery points out the difficulties of winding universal coils with enameled wire and suggests using cotton- or silk-covered wire for the best results. The fabric insulation has enough friction to form the proper universal coil shape. It's tough to find fabric-insulated wire in small gauges these days, but it's necessary for a professional looking result. For low frequency work, Litz wire should be used if maximum Q is desired.

Continued on page 54

MSC part no.	Description	Approx. Price
00208017	5-digit resettable mechanical counter	$9.52
06905251	1/4-in. revolving steel handle	$6.70
87986162	1/4 x 1/2 x 5/16 in. zinc-plated shaft collars	$0.43 ea.
87920138	1/4 in. diam. x 1-1/2 in. o.d. fender washer zinc-plated	$4.38 per 100
72025208	HSS special decimal size straight flute chucking reamer, size 0.2520 in.	$19.37
06010169	1/4 in. drill rod, 36 in. long, type W-1 water hardening	$1.52

Table 1. *Parts available from MSC.*

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Multiple CW Filters

Here are some clear descriptions and examples of how you can set up an active audio filter.

It's possible for your ear to sort out a single CW tone, but a very narrow CW filter makes it easier. While a narrow IF filter is ideal, they are expensive and difficult to install. A narrow, steep-skirted off-board audio filter is an attractive alternative. An active multipole audio filter is easy to build and much easier to install than an IF filter.

Realistically, an audio filter is not quite as good as an IF filter because of the limited dynamic range of the product detector that produces the beat note: A big signal within the IF bandpass, but outside the audio filter's bandpass, can cause desensitization. That limitation is a small price to pay for the cost and convenience of a good multipole audio filter.

Most audio filters are simple single pole affairs and their shape factor, a ratio of 3 dB bandwidth to 30 dB bandwidth, leaves something to be desired. When the peak response is at 800 Hz and the 3 dB bandwidth is 100 Hz, the 200 Hz bandwidth is only down about 7 db. That is, a signal at 700 Hz or 900 Hz is only down about 7 dB. Still loud enough to be aggravating.

To improve the shape factor requires a multipole filter. Every pole in the filter causes an attenuation of 6 dB for every doubling of the bandwidth. The response of a two pole filter falls 12 dB for every doubling of the bandwidth, a three pole filter attenuates the double bandwidth 18 dB, and a four pole filter offers 24 dB of attenuation at the double bandwidth.

Audio filters can be either active or passive. Passive filters use inductors and capacitors to achieve their selectivity, but multipole LC filters require inductors with high Qs. Active filters on the other hand use resistors, capacitors, and op-amps. With the introduction of IC op-amps, active filters became the filter of choice, even though they require power and can be overloaded.

A single pole active bandpass filter is shown in **Fig. 1**. It only takes three resistors and two capacitors. The design equations for the active bandpass filter are given to allow you to choose a different center frequency or bandwidth.

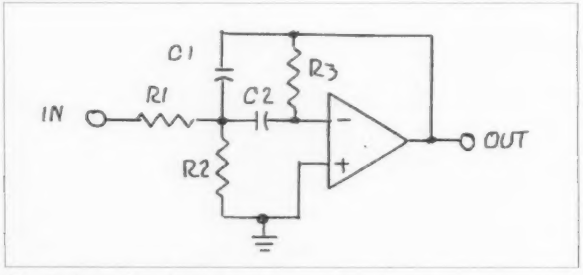

***Fig. 1.** A single pole active filter uses one op-amp.*

For the single pole filter shown in **Fig. 1**, with design criteria of f_o = 800 Hz, ß = 100 Hz, G = 1, C1 = C2 = 0.01 µF, the Q calculates to be 800/100 = 8. The open loop gain of the op-amp at 800 Hz must be greater than $2Q^2$ or 42 dB. An inexpensive LM741 can fill this bill. The design equations are:

$R1 = Q/(2\pi f_o CG) = 159.2k$
$R2 = Q/[(2\pi f_o C)(2Q^2 - G)] = 1253$
$R3 = 2Q/(2\pi f_o C) = 318.3k$
$C1 = C2 = C = 0.01\ \mu F$
$G = R3C2/[R1(C1 + C2)]$.
When C1 = C2, G = R3/2R1.

Q is $1/\delta = f_o/ß = 8$, f_o is the center frequency of the stage in Hertz, 800 Hz, ß is the bandwidth of the stage in Hertz, 100 Hz, and G is the voltage gain of the stage, one. All the resistors strongly affect bandwidth but R2 affects f_o as well.

A multipole filter is made up of several single pole filters, each with a different bandwidth and center frequency. But, as the number of poles increases, the Q of the filter's sections increase and the gain required of the op-amp increases, and the component tolerances become more critical. However, 1%

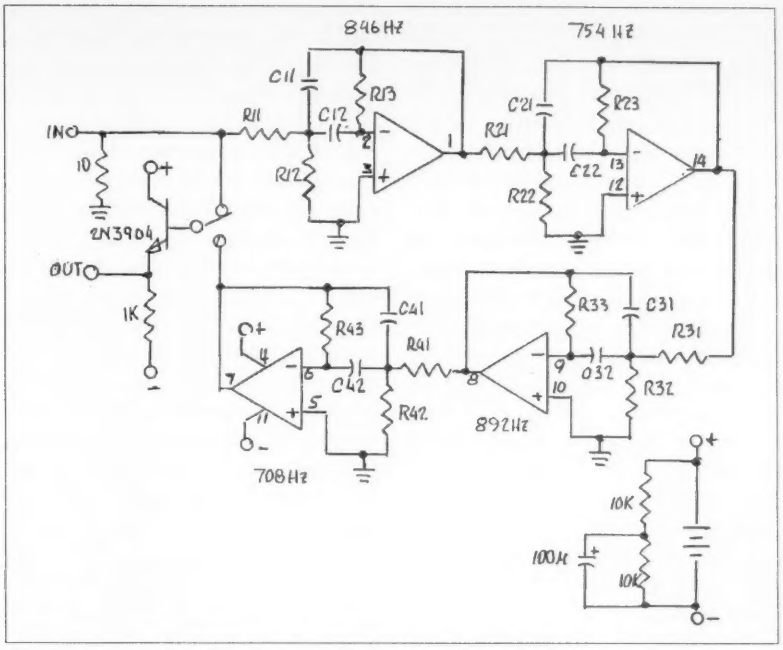

Fig. 2. A staggered quadruple active filter has excellent off-frequency response.

tolerance resistors (RN55 or equal) are satisfactory and 2% polyester capacitors (Xicon PFA103F and PFA104F) are available that can fill the bill.

A multipole filter can be considered as a stagger-tuned amplifier. A two pole filter is a staggered pair, a three pole filter is a staggered triple, and a four pole filter is a staggered quadruple.

The shape factor, typically the ratio of the 60 dB bandwidth to the 6 dB bandwidth, is determined by the number of poles. The frequency response of a number of cascaded stages tuned to the same frequency has the same shape as a single stage even though the bandwidth shrinks. That is, the overall 3 dB bandwidth will shrink by the same factor as the 12 dB bandwidth. For example, two cascaded synchronous stages have a 3 dB bandwidth that is approximately 64% of that of a

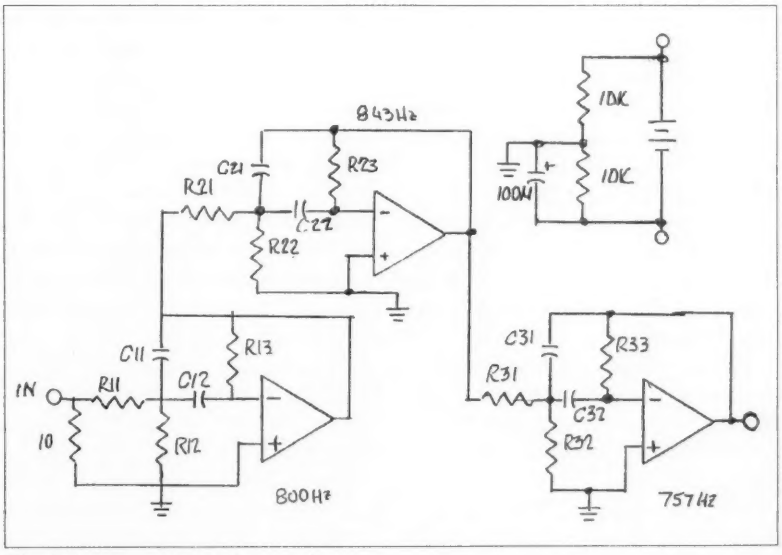

Fig. 3. A staggered triple is an option.

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Multiple	Tuned Frequencies	Dissipation
Pair	Two stages at $f_o \pm 0.35ß_o$	0.71δ
Triple	One stage at f_o	1/δ
	Two stages at $f_o \pm 0.43ß_o$	0.5δ
Quad	Two stages at $f_o \pm 0.46ß_o$	0.5δ
	Two stages at $f_o \pm 0.92ß_o$	0.19δ

Table 1.

STAGE	f_o (Hz)	Q	R1 (Ω)	R2 (Ω)	R3 (Ω)	C (µF)
1	846	16	30.1k	59	60.4k	0.1
2	892	42.1	75k	21	150k	0.1
3	708	42.1	95.3k	26.7	165k	0.1
4	754	16	34k	66.5	68k	0.1

Table 2.

STAGE	f_o (Hz)	Q	R1 (Ω)	R2 (Ω)	R3 (Ω)	C (µF)
1	846	17.6	33.2k	53.6	66.5k	0.1
2	892	46.3	82.5k	19.1	165k	0.1
3	708	46.3	105k	24.3	210k	0.1
4	754	17.6	37.4k	60.4	75k	0.1

Table 3.

STAGE	f_o (Hz)	Q	R1 (Ω)	R2 (Ω)	R3 (Ω)	C (µF)
1	800	8	15.8k	124	31.6k	0.1
2	843	16	30.1k	59	60.4k	0.1
3	757	16	33.64k	64.9	66.5k	0.1

Table 4.

single stage, and the doubled bandwidth also shrinks to 64%. Cascading stages doesn't improve the shape factor. Stagger-tuning does.

A multipole filter or a stagger-tuned amplifier has a number of stages, each tuned to a different frequency and each with a different individual bandwidth. For example, the two stages making a staggered pair are tuned to $f_o \pm 0.35ß_o$, each with a dissipation of 0.71δ, where f_o is the center frequency, the 3 dB bandwidth is $ß_o$, and δ is $ß/f_o$. δ is 1/Q. A flat staggered pair centered at 800 Hz, then, is made up of two stages, one tuned to 835 Hz and one tuned to 765 Hz, each with a Q of 11.26. Flat staggered just means there is no ripple in the pass band.

Increasing the Q or increasing the stagger frequencies introduces ripple in the pass band and in the process improves the shape factor somewhat, but ripple in the pass band tends to cause ringing. I don't find the ringing noticeable when the ripple is 1 dB or less.

When the bandwidth is very narrow the filter will ring. The high Q of the narrow band circuit is the culprit. The single crystal filters common in years past rang like a bell when they were in their sharpest positions. Broader multipole filters with sharper skirts overcame the ringing problem yet retained the selectivity.

When the Qs of multipole filters are increased slightly, the rejection of off-frequency signals is greater than that obtained with a flat staggered filter. Increasing the Q by 10% over the flat staggered Qs is hardly noticeable except for the improved selectivity.

Increasing the number of poles sharpens the skirts of the filter and improves the shape factor. A flat staggered triple made of two stages staggered at $f_o \pm 0.43ß_o$ of dissipation 0.5δ and one stage centered at f_o with bandwidth $ß_o$ is shown in **Fig. 3**. The response at twice the 3 dB bandwidth is down about 18 dB. Not bad, but the price of an active quadruple filter is so low, you should go for the extra stage.

A flat staggered quadruple made up of four stages is shown in **Fig. 2**. Two stages are tuned to $f_o \pm 0.46ß_o$ of dissipation 0.5δ and two stages tuned to $f_o \pm 0.92ß_o$ and dissipation of 0.19δ. The flat staggered response at twice the 3 dB bandwidth is down about 24 dB from the peak.

A 10% overstaggered quadruple centered at 800 Hz with a 3 dB bandwidth of 100 Hz would have a signal at 700 Hz or 900 Hz reduced by 30 dB, practically gone.

For a flat staggered 800 Hz quadruple, the Q of two of the sections are about 42.1. The open loop gain of the op-amp making up the filter pole should be considerably greater than $2Q^2$. Therefore, the open loop gain of a stage with a Q of 42 should be greater than 71 dB. Inexpensive quad op-amps like the Maxim MAX4492ASD or TI's TLC074 have a gain bandwidth product of 10 MHz, and the gain at 1 kHz is about 80 dB.

Four-pole audio filters aren't difficult to build: A single quad op-amp like the TLC074 or MAX4492ASD and a dozen resistors and eight capacitors is all it takes. The Qs required in multipole filters will be relatively high and as a consequence the component tolerances become rather critical. Resistors with 1% tolerance (RN55s or equal) and 2% capacitors with polyester films by Xicon (0.01 µF, PF2A103F, and 1 µF, PFA104F) are fine. Since capacitors are more difficult to find, practical values of C are chosen for the design and the appropriate resistors calculated.

The center frequency is rather arbitrarily chosen to be 800 Hz because our hearing is most acute at about 800 Hz. But certainly a different center frequency can be used. The audio bandwidth chosen is also rather arbitrary.

In choosing the bandwidth you must consider the stability of the transmitter and receiver as well as the bandwidth of the signal if the signal is to stay in the 100 Hz pass band. The stability of modern transceivers are seldom a problem, but stability isn't always certain. Needless to say, the filter is not tunable, so when you decide on a frequency and bandwidth, that's it.

While a quadruple is an excellent filter and economical in that it uses all four of the op-amps in a package of four, you can make a two pole (staggered pair) or three pole (staggered triple) filter. It depends on what op-amps you have available. The shape factor improves when the number of poles is high.

The tuning and Qs for some n-uples are given in **Table 1**. The center frequency is f_o, overall bandwidth is $ß_o$, dissipation is δ, and stage Q is 1/δ.

A quadruple made of four stages is shown in **Fig. 2**. The values given in **Table 2** are for a flat staggered quadruple centered at 800 Hz with a

bandwidth of 100 Hz. The quadruple is made with four stages tuned to different frequencies and with different bandwidths. The resistances given are the nearest 1% values.

The order of the stages is not important, but the loading on the last stage can limit the maximum open loop gain. The values given above produce a filter with no ripple in the pass band. Improvements in selectivity can be obtained by overstaggering, increasing the Q slightly. For example, increasing the Qs by 10% changes the resistor values as shown in **Table 3**. Increasing C reduces the resistance values, and the lower resistance values reduce the effects of the op-amp's offsets.

A staggered triple uses three op-amp stages and the response is not quite as good as a quadruple, but it's still pretty good. The Qs aren't as high as those required by the quad and the filter is less sensitive to component variation. The lower Qs means op-amps like the LM324 or LM741 with lower gain bandwidth can be used. The tuned frequencies of a triple are one stage at f_o with bandwidth of $ß_o$, and two stages at $f_o \pm 0.43ß_o$ with a dissipation of 0.5δ. A triple is shown in **Fig. 3**. The tuning and Rs and Cs of the stages making up a staggered triple are shown in **Table 4**.

Again, overstaggering the triple by increasing the Q slightly will increase the ripple in the pass band and improve the shape factor. The octave bandwidth (200 Hz) will be down about 24 dB when the bandpass ripple is increased to about 0.5 dB compared to 18 dB for a flat staggered triple.

A staggered pair that uses just two op-amps will have a poorer shape factor than a staggered triple. The response falls off at 12 dB per octave of bandwidth, but requires lower Qs and is more tolerant of component variation. The stages of a staggered pair are tuned to $f_0 \pm 0.35ß_o$ each with a dissipation of 0.71δ. The tuned frequencies and RCs are shown in **Table 5**.

STAGE	f_o (Hz)	Q	R1 (Ω)	R2 (Ω)	R3 (Ω)	C (µF)
1	835	9.01	16.9k	107	34k	0.1
2	765	9.01	18.7k	115	37.4k	0.1

Table 5.

Overstaggering a pair narrows the 12 dB bandwidth and increases the ripple in the passband. With about 1 dB ripple in the passband, the octave bandwidth (200 Hz) will be down about 14 dB. Not a great improvement, but every little bit helps. A staggered pair is shown in **Fig. 4**.

The output of the filter can't drive a pair of earphones without some help, so a 2N3905 emitter follower is used to generate the necessary power to the phones or a small speaker.

A switch to bypass the filter switches the input from the filter to the emitter follower. The output of the receiver is terminated in $10 \pm 10\%\Omega$ to hold the difference in level somewhat constant as the input is switched between the emitter follower and the filter. A switch to bypass the filter allows you to search the band more rapidly and maybe find that rare one and then switch in the filter to clear out the clutter.

Switching the base of the emitter follower between the filter's input and output doesn't require much isolation in the switch because the gain of the filter is near one, and coupling from the filter's output back to the input through the wiring capacitance or switch isolation isn't likely to introduce oscillation.

The op-amp should be operated from a split supply for the op-amp to handle bipolar signals. Therefore, returning the non-inverting inputs of the op-amp to a virtual ground that is mid-way between the positive and negative supplies will allow filtering bipolar signals. Since there is no current into the non-inverting inputs, a bypassed resistive divider across a single supply can provide relative plus and minus supplies. A 9 volt battery will work if you can't steal a little current from the receiver.

A quadruple will clean up most of the stuff you hear and not cost an arm or a leg, either. The parts can be obtained from Mouser Electronics, 1-800-346-6873, 956 N. Main St., Mansfield, TX 76063 for under $15.

A receiver with only an SSB filter doesn't make for the best CW reception, but adding a four pole audio filter changes the complexion completely. It can even improve a receiver with a decent 500 Hz CW filter. 73

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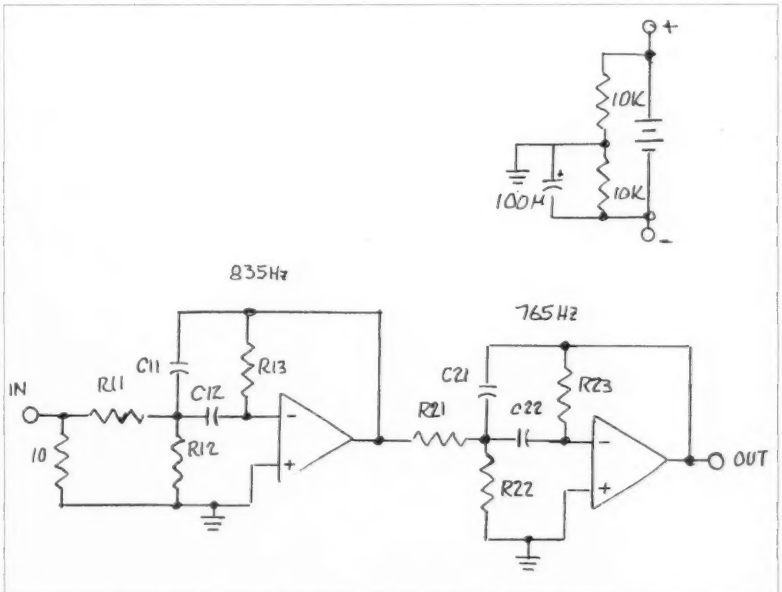

Fig. 4. A staggered pair is tolerant of component variations.

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Automotive Battery Voltage Monitor

Interesting to analyze, simple to build.

*The circuit in **Fig. 1** is useful for monitoring the voltage on an automotive or other battery. The design has three LEDs that light up individually to measure the charge on the battery powering the circuit. The resistors R2, R3, R4, and R5 as shown on the schematic set the low threshold voltage at 11V and the high threshold voltage at 15V.*

The outputs of the LM339 (U1) are open-collector. When the voltage at a non-inverting input of a comparator is greater than the voltage at the inverting input, the output of that comparator is high-impedance. If the non-inverting input voltage is less than the inverting input voltage, the output is low. R1 and D1 set the reference voltage for all of the comparators at approximately 5.1V. The outputs of U1A and U1D both go low when the output from the voltage divider formed by R4 and R5 is less than 5.1V. R4 and R5 have been chosen so that this happens when V_{bat} is less than 11V. The outputs of U1C and U1B go low when the voltage divider formed by R2 and R3 produces a voltage greater than 5.1V. This happens when V_{bat} is greater than 15V. When U1D is low, the under-range LED (D4) turns on. If U1C is low, the over-range LED (D2) is illuminated. U1A and U1B have their outputs wire-ORed. Therefore, if either U1A or U1B is low, Q2 is off and the in-range LED (D3) does not glow. When U1A and U1B both have high-impedance outputs, R6 pulls the base of Q3 high and the in-range LED is turned on.

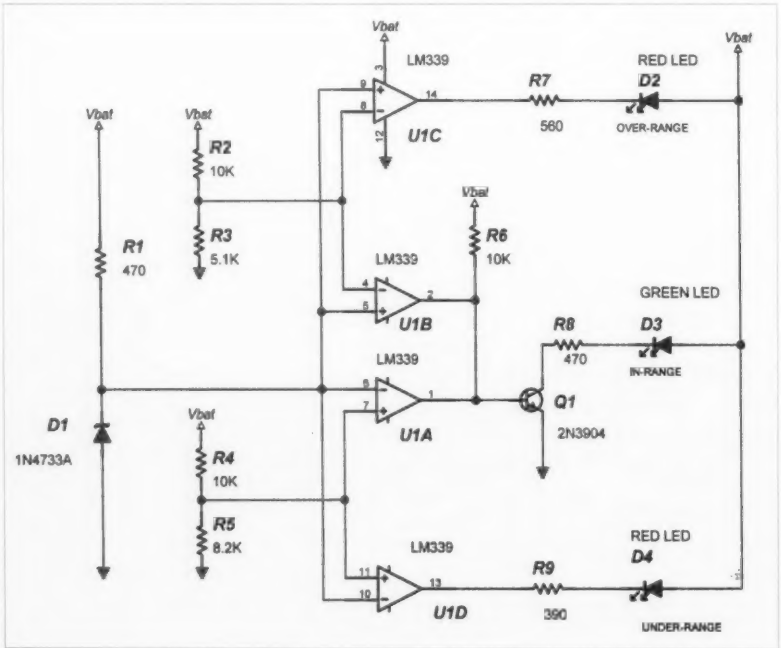

***Fig. 1.** Automotive battery voltage monitor. Note: All resistors are 1/4W 5%. When V_{bat} < 11V, D4 is illuminated. When 11V < V_{bat} < 15V, D3 is illuminated. When V_{bat} > 15V, D2 is illuminated.*

Theory of operation

The values of R4 and R5 determine the low threshold voltage of 11V, while the values of R2 and R3 determine the high voltage threshold of 15V. These limits can be changed by varying the resistors in the voltage dividers. The voltage divider formula for R4 and R5 is given by:

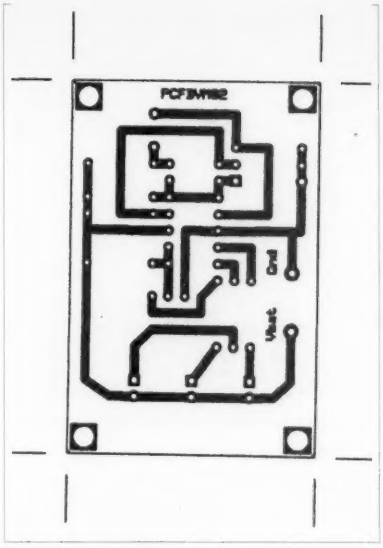

Fig. 2. 1x PCB positive artwork.

$$V_{out} = V_{bat}[R5/(R4 + R5)]$$

V_{out} is the voltage at the node where R4 and R5 connect. R4 is arbitrarily picked to be 10k. V_{out} must equal 5.1V when V_{bat} equals 11V. Solving the voltage divider equation for R5 yields:

$$R5 = R4/[(V_{bat}/V_{out}) - 1] \approx 8.6k$$

R5 is chosen to be 8.2k, the closest standard 1/4W 5% resistor to 8.6k. Solving the voltage divider equation for V_{bat} with R5 = 8.2k, R4 = 10k, and V_{out} = 5.1V gives a V_{bat} threshold voltage of 11.3V. If more accuracy is desired, a 1/4W 1% resistor of 8.66k may be used. To determine the value of R3 necessary for the 15V high threshold voltage, use the equation:

$$R3 = R2/[(V_{bat}/V_{out}) - 1] \approx 5.1k$$

where V_{bat} = 15V, R2 = 10k, and V_{out} = 5.1V.

Solving for these parameters results in R3 = 5.15k, so a 5.1k 1/4W 5% resistor is used.

If the threshold voltages are changed, the LED current limiting resistors must also be changed. Desired LED current is 20 mA. If a low threshold voltage of 6V is used R9 as well as R5 must be changed. The calculated value is R9 = (V_{bat}-V_{led}) / I, where V_{led} is the LED forward bias voltage drop (2.1V) and I is the desired current. This gives R9 = (6V - 2.1V)/.02A = 195 Ohms. The closest 5% resistor is 180 Ohms. For the high voltage threshold, R7 is changed in a similar fashion. R8 is calculated with V_{bat} = ($V_{highthreshold}$ - $V_{lowthreshold}$)/2.

Construction

Fig. 2 shows the 1x positive artwork for the printed circuit board. Once the board has been etched, the text on the solder side should read "PCFBVM02", not its mirror image. The mounting holes of the PCB are 1/8 inch in diameter. The diameter of the holes for D1 are .04 inch, and the remaining holes are .031 inch in diameter. Solder the components to the circuit board as shown in **Fig. 3**. Component values are referenced in **Table 1**. Use a socket for U1 and don't forget to install jumper JP1. Be sure to observe polarity when mounting D1 and the LEDs. Solder a black wire to the Gnd pad and a red wire to the V_{bat} pad. Insert U1 into its socket.

Name	Description
R1, R8	470 Ω (all resistors 1/4 W 5%)
R2, R4, R6	10k
R3	5.1k
R5	8.2k
R7	560 Ω
R9	390
D1	1N4733A
D2, D4	Red LED
D3	Green LED
Q1	2N3904
U1	LM339
—	14-pin socket
—	Hookup wire

Table 1. Parts list.

Conclusion

Apply voltage to the circuit with an adjustable power supply. Sweep the

Continued on page 54

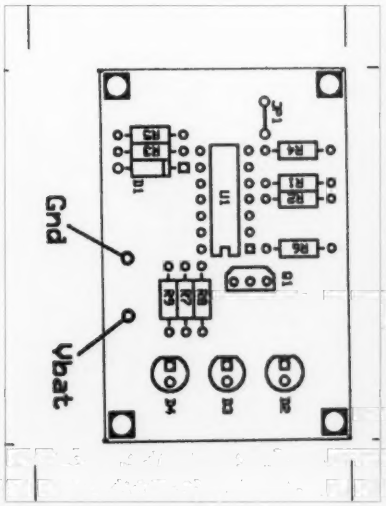

Fig. 3. Component placement.

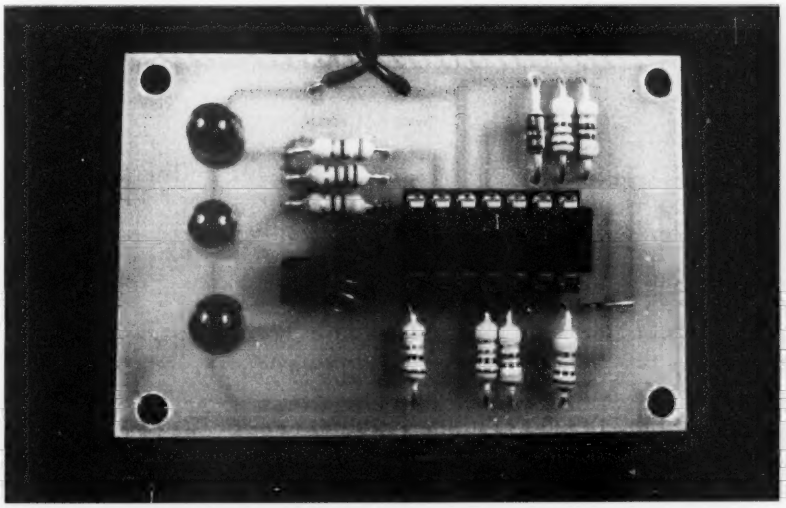

***Photo A.** Automotive battery voltage monitor.*

Henryk Kotowski SMØJHF
Sibeliusgången 28, XI
SE-164 77 Kista
Sweden

Travels with Henryk — Part 9

CQ de Havana.

I have visited both Cuba and the Dominican Republic twice. It was interesting to compare amateur radio in these neighboring countries. Cuba is separated from Hispaniola, the island shared by Haiti and Dominican Republic, by the narrow Windward Passage. Basically, the islands have a very similar climate, geography, and history. Present-day societies in these countries are, however, organized differently, and these differences are also reflected in our hobby.

One of my guides to amateur radio in Cuba was Antonio (**Photo A**). He is a professor of medicine and has both equipment and antennas that are above the average in Cuba. His vintage gear was brought from Angola, Africa, by Cuban troops in the late '70s. Antonio lives in downtown Havana (**Photo B**) and has assorted wire antennas on his roof.

Another ham that I visited in Havana was Winstown CO2WF. He is much younger than Antonio and has a more advanced antenna system (**Photo C**) on his roof. Also, the equipment is at least a decade younger (**Photo D**). Winston's father was a ham, too. Now he lives in the USA, and it's from the USA that Winston gets the hardware.

I met both Winston and Antonio at the headquarters of Federacion de Radioaficionados de Cuba. The FRC is the hub of all amateur radio activity on the island. Every Saturday, long-lasting

Photo A. *Antonio CO2AA in his well-equipped shack. All photographs by Henryk Kotowski SMØJHF.*

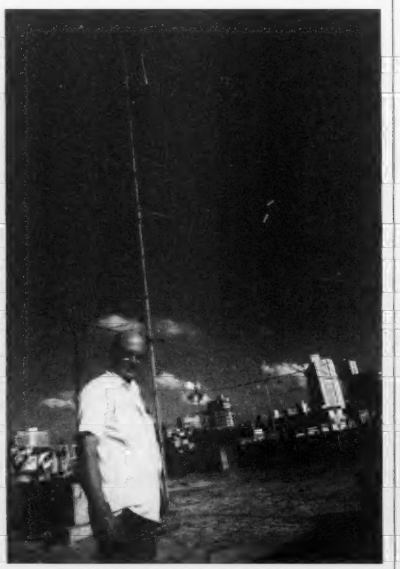

Photo B. *Antonio CO2AA on the roof with his antenna in the background, downtown Havana.*

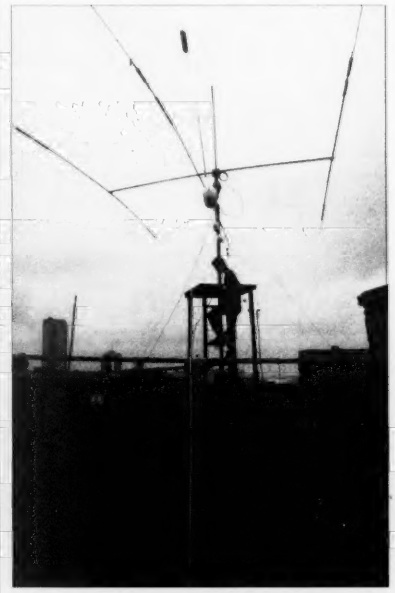

Photo C. *Winston CO2WF on his roof in Old Havana.*

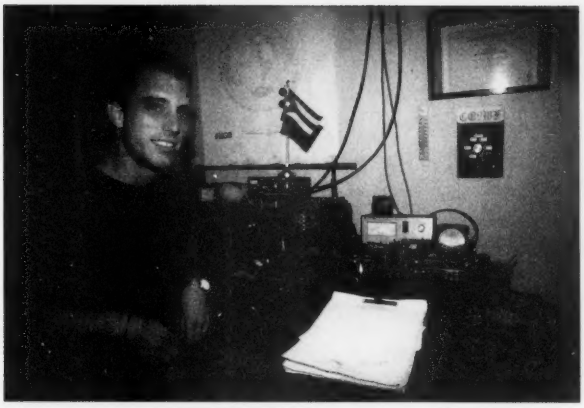

Photo D. *Winston CO2WF at the rig.*

Photo E. *Typical Saturday meeting at the Federacion de Radioaficionades de Cuba in Havana.*

Photo F. *The president of FRC, Pedro CO2RP, at the headquarters.*

meetings are held at the headquarters. Some members come here just to meet friends (**Photo E**), while others look for spare parts for their equipment in the small store run by Conrado CM2CO (**Photo H**). There is a club radio station at the headquarters with the distinctive callsign CO2FRC (**Photo G**). Once a month, license tests are held for new hams at the HQ, and I must confess that the enthusiasm for becoming a ham in Cuba is compelling (**Photo J**). Lunch is served at the club (**Photo I**) and even I was treated to a traditional Cuban meal with black beans and rice. The president of the federation, Pedro CO2RP (**Photo F**) is busy keeping in touch with all local radio clubs in this long country. The organization has over 4,000 members and 75% of them hold a license.

CUBA

Federacion de Radioaficionados de Cuba [FRC]

Location: Paseo #611, entre 25 y 27, Plaza de la Revolucion, Havana 10400
Address: P.O. Box 1, Havana 10100
Tel: +53 (7) 34811 & 302223
Fax: +53 (7) 335365
E-mail: [frcuba@ip.etecsa.cu]
Web: [http://frc.co.cu]
President: Pedro Rodriguez CO2RP
Secretary: Oscar Morales, Jr. CO2OJ
IARU liaison: Vice President Francisco Hernandez CO2HA

I was fortunate to be able to visit one such local club. It was in the tourist resort of Varadero, east of Havana. This is where most tourists come and enjoy long, empty beaches. I am not a beach buff, so while footing Varadero I spotted some wire antennas in the residential part of the town. It turned out to be Jose's CM5MA skywires. Jose has a

Continued on page 24

Photo G. *The HQ station of FRC, CO2FRC. Oscar CO2OM (sitting) and Oscar Jr. CO2OJ standing. CO2OM is now SK.*

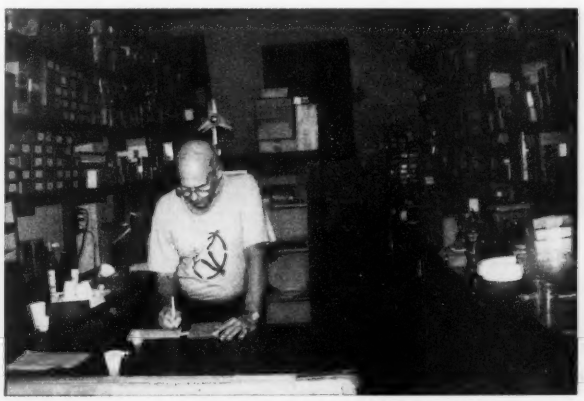

Photo H. *At the FRC store, Conrado CM2CO sells spares and components.*

Photo I. *Eating after the meeting.*

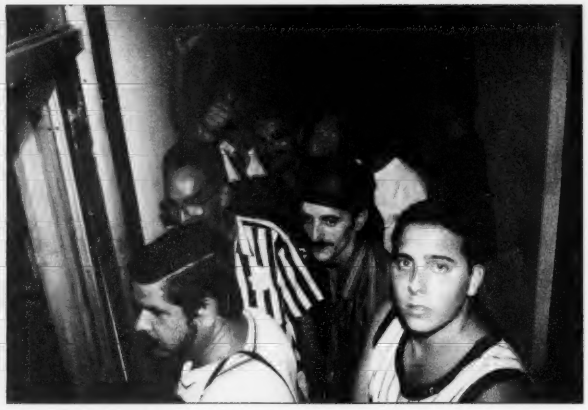

Photo J. *A line of eager hams-to-be waiting for the license test at FRC.*

Travels with Henryk — Part 9

continued from page 23

modern station and quickly announced my presence in town on 2m FM . Soon, Victor CM5VV dropped in (**Photo K**). Victor only had a 2m handheld radio — no HF station at all.

Jose directed me to the local club CO5ENA (**Photo L**) lodged in the house of Alberto CO5AM and his wife Belgica CL5NN. Two newly licensed local boys were at the club when I dropped in. They were talking mostly with other Cuban stations on 80 meters. At the age of 18 they could not possibly afford any equipment of their own.

The average income in Cuba is extremely low. However, foreign tourists and small private businesses give more profits. But the major source of cash and commodities are exiled Cubans in the USA supporting their next of kin at home.

Amateur radio is strictly controlled by the State and the economy restrictions make this hobby accessible mainly for privileged people. A successful ham in Cuba must be approved by the authorities, gain the required skills, and afford the gear. Those who meet these demands are usually devoted to the hobby and are really active. In Dominican Republic buying equipment is not a big deal. The authorities are generous when issuing licenses but ... the activity is not as high as in Cuba.

Striving for something probably creates deeper affection, while things that come easily have lower value. Also, the number of available pastimes in Cuba is limited. Everywhere, hams in rural areas are much more engaged in the hobby than those living in metropolises.

Some friends asked me how I dared to go to Cuba, a country having an austere reputation. Well, I myself lived some 30 years in the post-WWII reality of Poland and I still remember what every foreign visitor to my country meant then to common people like me. 73

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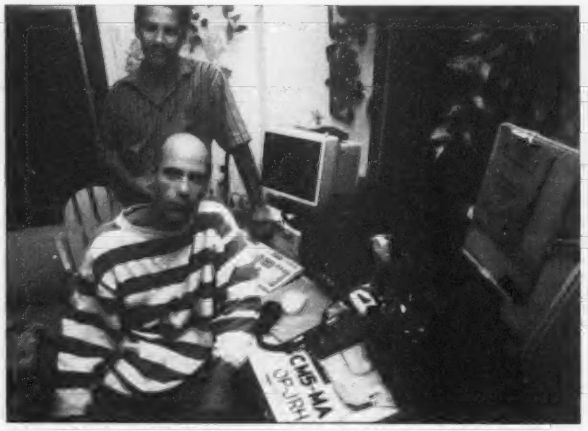

Photo K. *Jose CM5MA and Victor CM5VV behind him at the QTH of Jose.*

Photo L. *Radio club CO5ENA in Varadero, Cuba. Standing Osmani CL5ENC, sitting Alberto CO5AM, his wife Belgica CL5NN, and Yandis CL5ENB.*

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I Love My 80m Loop!

And you will, too!

Much has been printed over the years on loop antennas. Experimenting with wire antennas is a favorite pastime for me. I recently had such great results with a delta loop on 10 meters and a rectangular loop on 20 meters (50+ countries in 3 weeks of casual operating!) that I decided to take the plunge and put up an 80 meter full-wave horizontal loop that would allow operation on all HF bands.

After gleaning all the info in the articles referenced below, and adding my own twist, the antenna would either work or be a "cloud-burner." I am happy to say that this simple antenna far exceeded my expectations! What I found to be so appealing about this antenna was that it was fairly economical and easy to build and install, works on all HF bands, and requires no special feed networks — only a transmatch, coax, and some space!

80-meter horizontal square loop

The length of a full-wave 80-meter loop is about 270 feet (1005 divided by frequency in MHz), or about 67 feet per side. I use "about," because exact numbers are not that critical according to my results. In my opinion, when constructing antennas, not only is the old saying "the higher the better" true, but "the longer the wire the better" may also fit some loops. Since I live on 10 acres in the country, I decided to make my horizontal loop longer to start with to better fit my backyard. So, my "longer" loop is about 1.25 wavelengths on 80 meters (2.5 on 40m, 5 on 20m and 10 on 10m) and is installed between 30 and 40 feet in the air.

Scaled-down versions, say 75% of a wavelength, may also work fine if you don't have the room for a full-wave or longer antenna. According to antenna experts, a circular loop is "ideal," but impractical for most hams. I found a square — or even a rectangular loop — is easier on the pocketbook and muscles to put up, and would provide about the same results.

To support my loop made from salvaged telegraph line wire from the Yukon Territory (just think about the stories this wire has already told!), I used my 50-foot-tall tower and three masts, each 35 to 40 feet long, made from 2-inch galvanized water pipe. Each support is "supported" by one 1/4-inch-diameter steel guy wire attached by a U-bolt in the opposite direction of the wire's "pull" and a small pulley with 3/8-inch-diameter rope for hoisting up the wire to the top of masts (**Photo A**).

The telegraph wire is #6 AWG copperclad steel and not all that easy to work with, but the price was right. For the feedpoint connection I used a 1-1/2" PVC pipe T terminating the antenna wires to a 1/4" eye bolt as used on some commercially made baluns. RG-213 coax (chosen for strength and durability, and because I may use an amplifier) terminates on the eyebolt nuts with two flat washers (**Photo B**). The coax is taped to a ten-inch-long bottom extension of the PVC T to remove strain on the

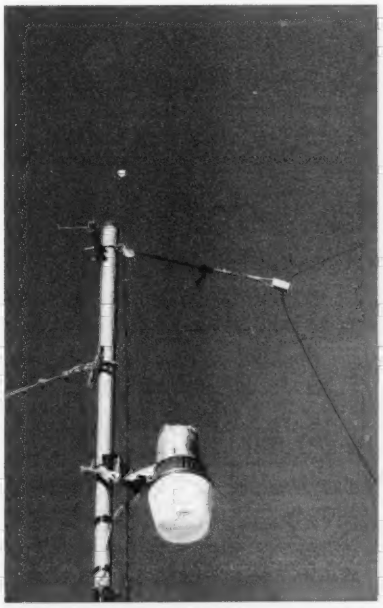

Photo A. *Pulleys and U-bolts are two of the tools you will need in erecting this antenna.*

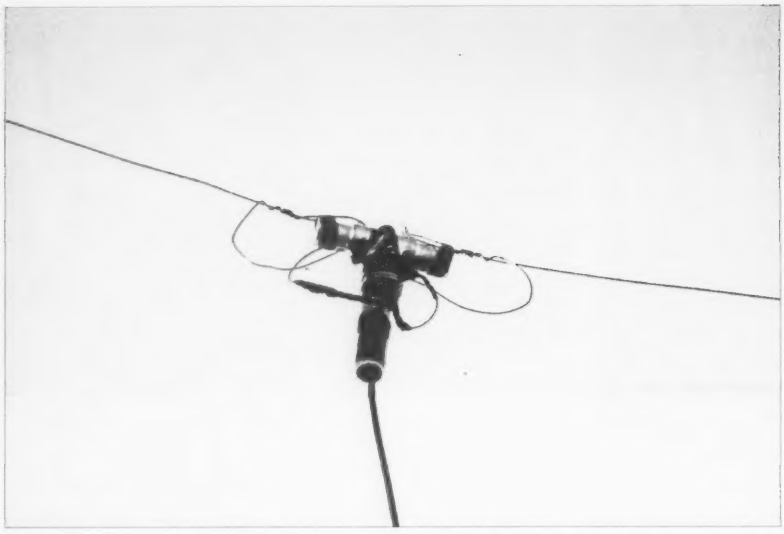

Photo B. *All connections in this PVC T assembly have been treated with silicone caulk to ensure that they are weatherproof.*

hanging coax. Silicone caulk was then applied to the connections for weatherproofing. For antenna insulators, I used porcelain electric fence insulators. Once the support masts, complete with guy wires (**Photo C**) and pulleys, are installed, raising the wire becomes a one-man operation.

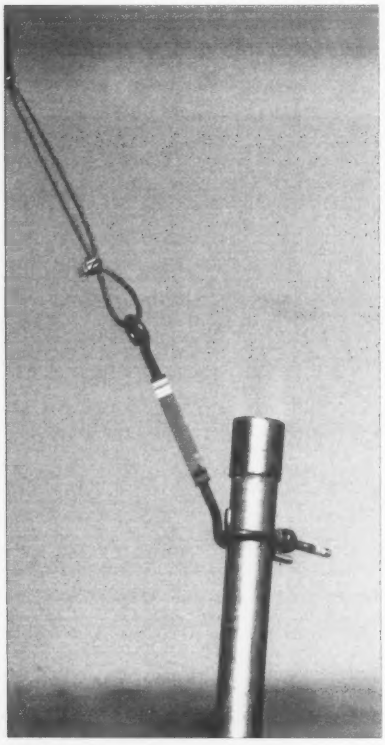

Photo C. *Guy wire assembly.*

On my tower, I installed a six-foot-long 4x4 painted wood post hanging off near the top of the tower for one of the four required supports (**Photo D**). On the post end that is farther away from the tower I used an electric service entrance insulator fastened by U-bolt to "float" (ref. *ARRL Antenna Book*, page 5–17) the antenna wire as with the other three supports. I wasn't sure if all "floaters" would actually allow the wire to float, but they did quite easily.

The wire antenna and feedline connections were made up on the ground and then hoisted up each mast one-by-one with the rope and pulley. Once the wire was in the air and about a foot or two away from the masts, I merely tied off the rope to whatever was handy (e.g., nearby barn roof, tree, etc.). I only had to take up a bit more slack from one pulley (the wire pulls through all the pulleys) for final wire sag adjustments. Since my wire was very heavy-duty, I could pull it tight. Your sag will depend on the type and size of wire used. Smaller-gauge wires will break if pulled too tight or used on long spans — just ask me! My loop is fed about midspan and the coax drops 30 feet straight down into my shack.

How does it work?

During the first three months of use (October through December), 75% of my QSOs on 10 and 20 meters were either 5x7 or 5x9 reports "both ways." About 75% of them were with stations outside North America (about 10% were 5x9 +20!), and about 20% of the total Qs were 5x5 to 5x1 quality "both ways." For those doing the math, call the remaining 5% split equally, 3x3 signals, or simply "no contact at all" (you can't work them all!). Also, my log indicates a "sent" report was the same as "received" most of the time. I even broke several big pileups on the first or second call.

Directivity? Well, the loop seemed to work just fine equally in all directions (I'm still scratching my head!). That's what I really like about this loop!

Gain, you ask? Well, some, depending on your choice of feedline and how high you install your antenna. L.B. Cebik W4RNL goes into a lot of detail on gain (see #4) in his article, so I won't get into that here. Although I have tried this antenna mostly on 10 and 20 meters, I was also pleased with a weekend of experimenting on 15 and 17 meters. DX worked on 15 meters: KL7, HL5, JR1, KHØ, RV9, and BD4. DX worked on 17 meters was KL7 and OH1. Many Ws and VEs were also worked on 15 and 17 meters. Both bands produced about the same results on signals mentioned above over the two-day period of tests. I am confident this antenna will produce good results on 40 and 80 meters as well. I know it tunes 40 and 80 meters quite fast! To give a better perspective on this versatile antenna, on December 29, 2001, I worked my buddy Rick KL7AK back-to-back on 15, 17, 12, and 40 meters! On 15 and 17 meters, we both exchanged 5/9 + 20 reports; on 12 and 40 meters we were up to 5/5 quality. Not bad for a piece of wire, eh?

I did learn however, both 300 watt manual tuners (MFJ and Vectronics) I used took some time to tune the loop, with a couple of bands requiring a lot of patience! I did not try the auto-tuner on my TS-570D since my Tucker 1.5 kW tuner easily handled the job quite fast

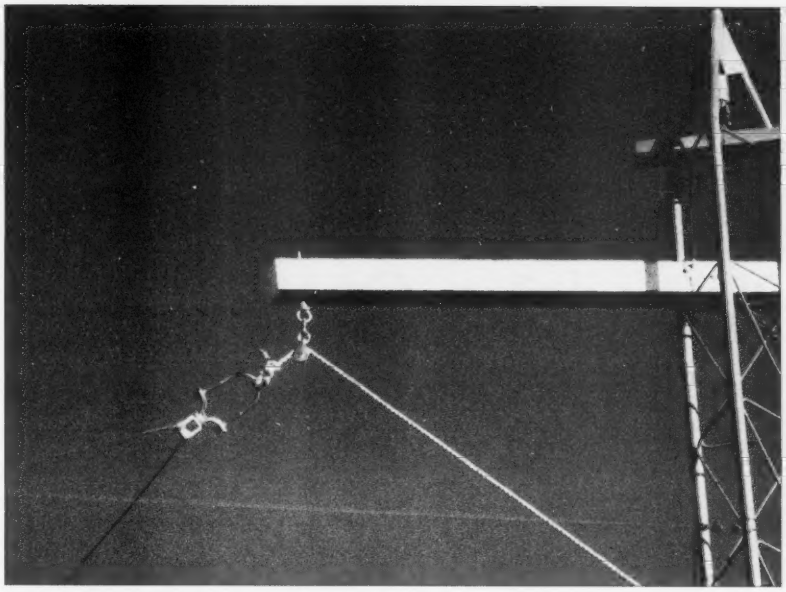

Photo D. One of the four required supports.

on all bands 80–10 meters. My tribander will remain stored in my garage as I work on a new loop design around 1,200 feet long supported off of 60-foot-tall power poles (but that's another article!) — when I tire of this antenna, that is! I highly recommend this antenna. Good luck with your antenna experimenting! Any and all feedback (*) is appreciated.

*I worked all over the USA and Canada, including: KL7, KH6, JY4, V47, KHØ, WP2, WP3, HP1, FO, PA2, 8R1, DS3, G3, LU1, ON7, JA (all), DU1, I2, ES1, UA9, and UA6 to name a few!

References

1. "The Loop Skywire," by WØMHS, *QST*, Nov. 1985, page 20, and *ARRL Antenna Book 16th edition*, page 5–16.

2. "The Droopy Loop," by KJ7MZ, *QST*, July 1996, page 57.

3. "Loop Antennas," *ARRL Antenna Book*, 16th edition, page 5–1 (note: #1 is available for download from the ARRL Web site: do "search" for "constructing loop antennas").

4. "HO-HO-HOHPLs," by W4RNL [www.cebik.com/atl1.html]. 73

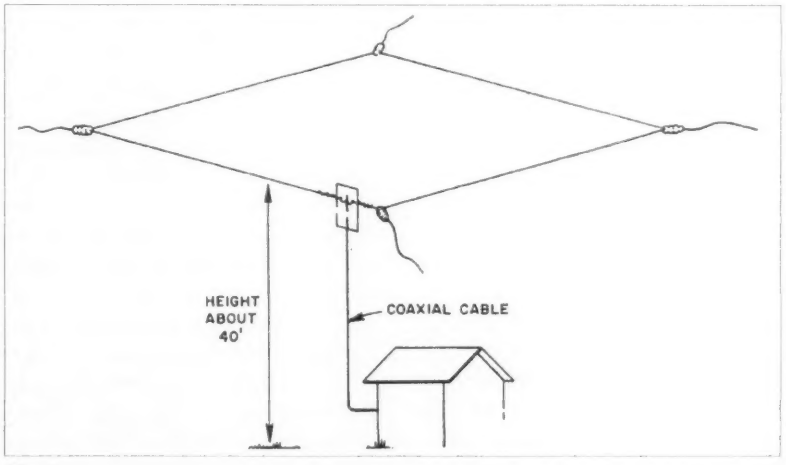

Fig. 1.

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No Place Like Ohm

A little refresher on the basis for most of what we do.

Has Congress sneaked through a new law to tax our brains? No. Ohm's law has been on the books for a long time. It hasn't been published in the Federal Register, *but is found in some physics texts. Yet, it is an essential law of electricity.*

George S. Ohm, a German physicist, formulated the relationship between current and voltage in 1827. He found that the current in an electrical circuit varies directly with the EMF (electromotive force). He introduced a proportionality constant R relating current to voltage. The expression for the current was I = E/R. The quantity R is called resistance and is usually written as the Greek letter Ω. The EMF is given as E, and the current, by I.

We know resistors as Bakelite cylinders with wires coming out the ends that my wife says look like little firecrackers. The resistance of wires or tracks on PC boards is considered as zero. When the wire resistance is low compared to the other resistance in the circuits, it can be ignored without serious consequences, but when the other resistance is very low, the wire resistance can't be ignored.

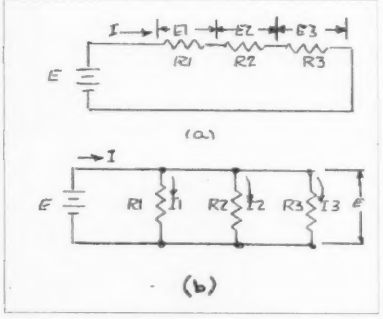

Fig. 1 (a) Resistors in series add. (b) Resistors in parallel have an equivalence that is smaller than the smallest resistor.

To illustrate the point that the resistance may be small but not zero: I was checking that the fuses in a piece of equipment would blow when the filament transformer's secondary was shorted. The filament transformer was rated at 100 A, and I attempted to blow the fuse by putting a two-foot AWG #18 short on the secondary. The short wasn't short enough. The resistance of the wire wasn't low enough. The insulation on the wire charred but the fuse didn't blow. It took the blade of a screwdriver across the terminals to do the job. A short is relative.

Every conductor has resistance. We may assume that the resistance of a wire is zero, but what we're really saying is that the resistance is low compared to the other resistance in the circuit and can be neglected. The "other" resistances include the internal resistance of the source.

In a series circuit, the same current flows in all parts of it. **Fig. 1** shows a series circuit in which the voltage drops across each of three resistors is E_1, E_2, and E_3, and $E = E_1 + E_2 + E_3$. Since the same I flows in each resistance, Ohm's law states that the total resistance is $R = E/I = (E_1 + E_2 + E_3)/I = E_1/I + E_2/I + E_3/I$, and using Ohm's law, $E_1 = R_1$, etc. The total resistance is $R_1 + R_2 + R_3$. This shows that the equivalent resistance of resistors connected in series is equal to the sum of the individual resistances.

In **Fig. 1(b)**, three resistors are shown connected in parallel. The currents in the resistors are I_1, I_2, and I_3 and the voltages across each resistor is E. Using Ohm's law, $R = E/(I_1 + I_2 + I_3)$. Inverting both sides of the equation, $1/R = (I_1 + I_2 + I_3)/E = I_1/E + E_2/E + E_3/E = 1/R_1 + 1/R_2 + 1/R_3$. The reciprocal of the total resistance is the sum of the reciprocals of the individual resistances.

The reciprocal of resistance is conductance, and G is equal to $G = 1/R = R^{-1}$. In a parallel circuit, the total conductance is equal to the sum of the individual conductances, $G = G_1 + G_2 + G_3$.

Before handheld calculators became common, calculating the conductance was a bit of a bother, and the equivalent value of two resistors in parallel was rewritten as $R = R_1R_2/(R_1 + R_2)$. With the handheld calculator the reciprocal is easy to compute and the total resistance is $R^{-1} = R_1^{-1} + R_2^{-1}$.

The resistors, those little firecrackers, have stripes of paint at one end that indicate the value of the resistance in ohms. The first band indicates the most significant number; the second, the next significant number; the third, the number of zeros, and the fourth band nearest the end, the tolerance. The color code used to mark resistors is common through out the industry. The color code for resistors is used for capacitors and transformers and anything else identified by numbers. The color code should be committed to memory if you have to pick different values out of the pile very often: 0 = black; 1 = brown; 2 = red; 3 = orange; 4 = yellow; 5 = green; 6 = blue; 7 = violet; 8 = gray; 9 = white; 10% tolerance = silver; 5% = gold.

A sexist saying to help remember the code is: Bad boys ruin our young girls, but Violet gave willingly. There are other politically correct sayings, but I can't remember them.

The standard values of resistors depend on their tolerance and the manufacturing process. For example, composition resistors are available with 5% and 10% tolerances. The significant numbers are as follows: 1.0*, 1.1, 1.2*, 1.3, 1.5*, 1.6, 1.8*, 2.0, 2.2*, 2.4, 2.7*, 3.0, 3.3*, 3.6, 3.9*, 4.3, 4.7*, 5.1, 5.6*, 6.2, 6.8*, 7.5, 8.2*, 9.1. The asterisk indicates values found only with 10% tolerance.

Thus, a 56k ±5% resistor is marked green, blue, orange, gold. A 1k ±10% resistor is marked brown, black, red, silver.

The flow of current through a wire or any other conductor always produces heat or dissipates power. The power dissipated depends on the current — the greater the current the higher the dissipation. Experiments show that doubling the current quadruples the power dissipated and that the heat produced is proportional to the square of the current. Still another factor is involved, namely the resistance of the conductor. Summing up, the power dissipated is proportional to the resistance of the conductor and the square of the current, $P = I^2R$.

The physical size of a resistor depends on the power handling capabilities. In general, larger sizes can dissipate more power or operate at a higher temperature. Different manufacturing techniques have different power/size relationships. For example, a wirewound resistor can dissipate more power for a given size than a composition resistor because it can operate at higher temperatures.

Since from Ohm's law, $I = E/R$, power can be expressed as $P = I \times I \times R = I \times E/R \times R = IE$. When the power and resistance are known, E causing the current flow can be calculated, $E = \sqrt{PR}$. When power and R are known, the current can be calculated $I = \sqrt{(P/R)}$.

Accordingly, the current in a 100 W 120 volt lamp is $I = P/E = 100/120 = 0.833$ A when 120 volts is applied. As an aside, the resistance of an incandescent lamp is not constant; it changes as the filament becomes incandescent and glows. As a general rule of thumb, the cold resistance is a tenth the resistance of the rated operating resistance. For example, the rated operating resistance of a 100 watt 120 volt lamp is $R = \sqrt{(E^2/P)}$, $R = \sqrt{(120^2/100)} = 12\Omega$. The cold resistance is only 1.2Ω when the lamp is first turned on, and increases when the lamp is bright.

In many cases, a source's internal resistance is assumed or ignored. But, depending on the source, it should be determined. The measurement for data to calculate the internal resistance of a source is simple. **Fig. 2(a)** shows a simple series DC circuit whose source resistance R_s is to be determined. The data needed to calculate the internal resistance is simple to find: Measure the open circuit output voltage, then load the source with a known resistance. And measure the loaded voltage. Calculate the current in the load with Ohm's law. Then, with the change in voltage and the calculated load current, the source's resistance can be calculated. For example, if the open circuit voltage from a battery drops from 9 volts to 8.8 volts when a 2.2k load is applied, the load current increases from zero to $8.8/2.2 \times 10^3 = 4 \times 10^{-3}$. The change in voltage is the drop across the internal resistance. The internal resistance of the source can then be calculated: $0.2V/4 \times 10^{-3} = 50\Omega$.

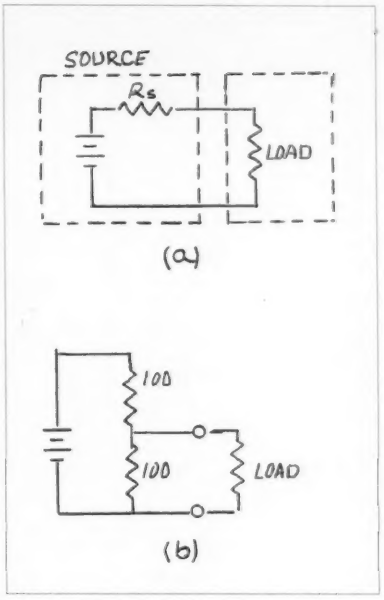

Fig. 2 (a) A battery has internal resistance. (b) A voltage divided source has an internal resistance.

The circuit of **Fig. 2(b)** shows a different kind of source, but the internal resistance can be found in exactly the same way. If the open circuit voltage

Continued on page 54

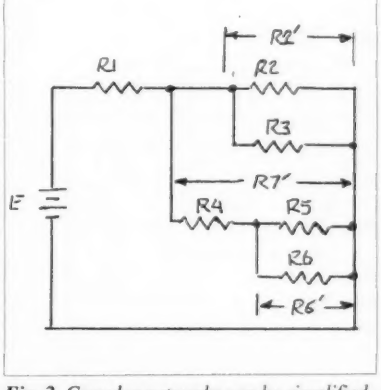

Fig. 3. Complex networks can be simplified.

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Solid State Junk Box Thermometers

Everybody needs one of these.

Do you, also, have a "catch-it" box that contains components you have collected over eons of time, and you wonder when you will ever find a use for some of them?

On observing some of my 50 years' worth or so of what I call "good stuff," and what my dearest refers to as junk, I noticed a few microammeters that I had saved because every ham needs a few of those — does he not?

As one of the meters was 0–100 microammeters, I was reminded of the freezing and boiling points Celsius, so why not build a solid state thermometer? I recall it being said that a silicon diode has a linear voltage drop per degree Celsius over a fairly large range. If you enjoy building your own circuits at times, you can easily build and enjoy this unit. All parts came from my spare parts locker.

The sensor diodes are attached to a pair of three-way posts, thereby allowing leads to be connected and the sensor to be placed remotely as needed. Use it to measure the temperature rise of a suspicious power transistor, transformer, or other component, as well as measuring the frequency drift of oscillator circuits. You can mount the sensor outside your shack and be prepared to answer that DXer with the temperature outside. Most of them use Celsius I have noticed. You may even use it to measure the temperature of liquids. By nulling out the null meter, you can see immediately the change that has taken place over a period of time in reference to a prior reading, without having to write the figures down and doing the math.

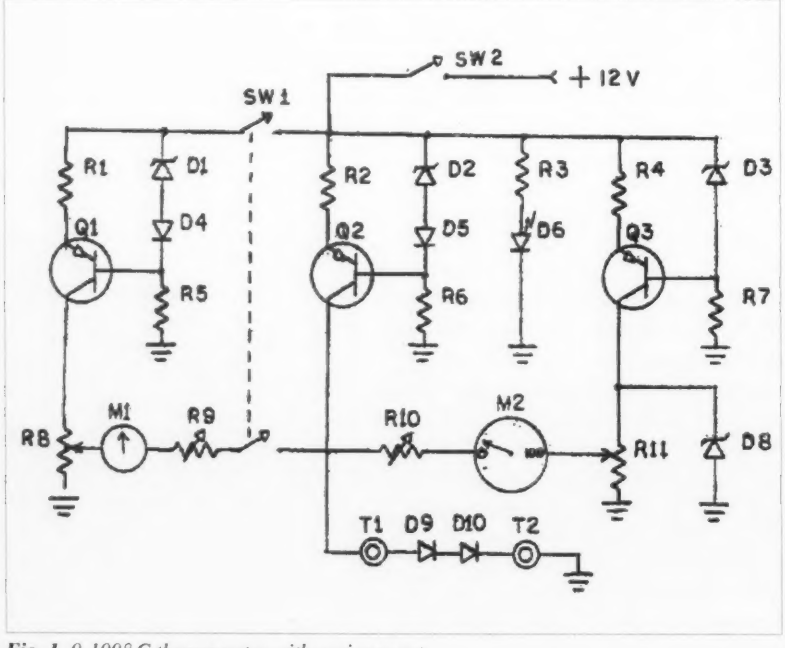

Fig. 1. *0-100° C thermometer with variance set.*

Figure 1

The central parts of the unit are the silicon diodes D1 and D2, used as a sensor. I used the 1N649 diodes as that was what I had on hand. While I am sure that others may suffice, I will

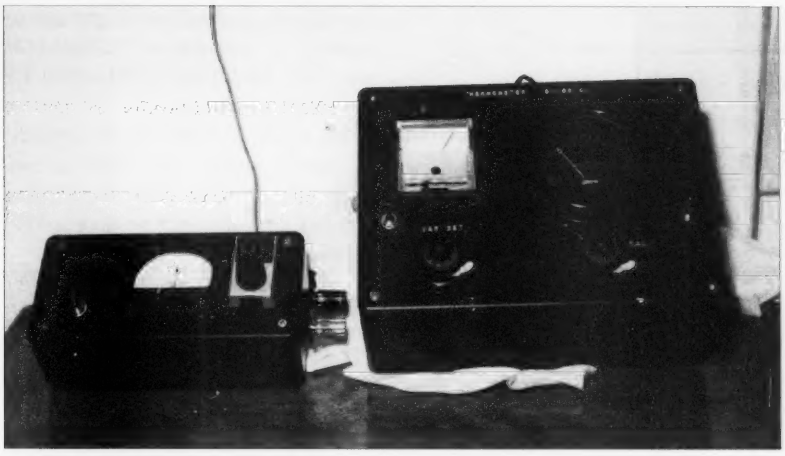

Photo A. *Both styles of thermometers.*

share one bit of experience gained from my days in an environmental laboratory. We found that the double-studded (no S-connector internally) diodes would sometimes show an open circuit when they had been cycled from a cold to an ambient temperature.

My old D.A.T.A. book does not show the temperature coefficient for switching diodes or rectifiers, but I seem to recall that the silicon diode had a negative Tc of 2 mV to 2.5 mV per degree Celsius. Then there is the choice of what steady current to use to arrive at the figure of 2 mV per degree C. My ham shack is "outback" and has to be heated with a small wood stove. I tested the diodes by connecting a current supply and, since it was winter, pulling on my long Johns, going out to the shack when it was near zero degrees, and measuring the voltage drop across the diodes at different current levels. I would start the wood stove, and at every five degrees increase in temperature, I would record the voltage drops at the different current levels.

Using two diodes in series for the sensor, we will have a negative voltage drop of 4 mV per degree C of temperature rise. For 100 degrees that will be a –400 mV change. So, for the 100 µA meter, the total meter resistance needs to be 4k ohms. The meter's internal resistance is 1.3k ohms, so trimpot R10, 5k ohms, is installed and adjusted to 2.7k ohms.

The sensor diodes are constant-current fed by Q2, D2, D5, R2, and R6. Diode D5 is to partially offset the positive Tc of zener D2. Zener D8, 1N825, sets the 6.2 volts for R11. This will provide R11 with a current near 12.6 mA. A constant current circuit of Q3, D3, R4, and R7 will provide approximately 20 mA, giving D8 a steady current of 7 to 8 mA. D3 must be a low enough value to allow for 12-volt power supply operation.

Initial adjustment may be made by setting the total meter circuit resistance to 4k ohms Then adjust R11 so the room ambient temperature is indicated on the meter. A further test, if desired, may be done by setting the sensor in a bath of ice water and adjusting R11 for zero degrees on the meter. The sensor diodes are connected in line and black shrink tubing covers the diodes and leads, leaving only enough leads showing to allow for remote leads to attach. Care should be exercised in putting the sensor in liquid so that only the part covered by tubing is immersed; otherwise, the signal could be shorted. Having set R11 for zero degrees, you may then desire to put the sensor in boiling water and notice that the meter should read close to 100 degrees. It will probably be a bit short as when full-scale current, 100 µA, goes through the meter circuit it also causes a few millivolts drop across a portion of R11. This is when R10 needs tweaking so that exactly 100 degrees is indicated on the meter.

The center scale meter, M1, circuit was added to provide a visual method of observing, at a glance, a temperature deviation between an earlier setting and a later reading rather than having to write the figures down and subtract. Meter M1 is a center scale meter with 25-0-25 µA end scale full-scale readings. However, the end scale numbers on the dial are 30-0-30. What we desire is to have the dial numbers to equate to

Photo B. *0-100° C thermometer with variance set.*

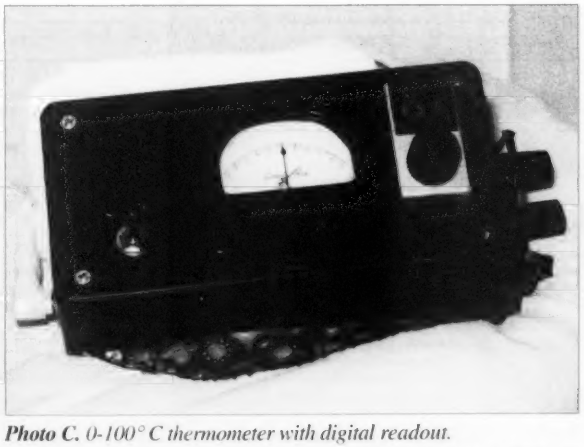

Photo C. *0-100° C thermometer with digital readout.*

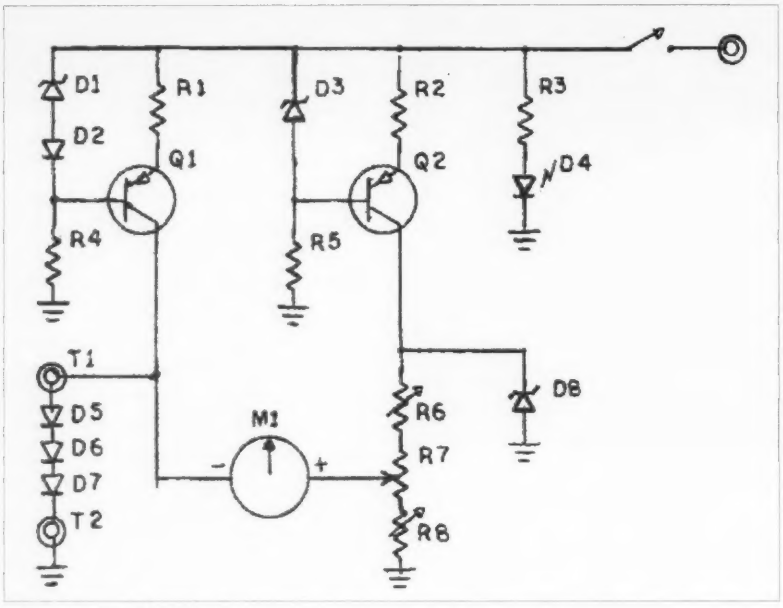

Fig. 2. Digital 0-100° C thermometer.

degrees C without having to extrapolate. This requires for full-scale deflection reading of 30 degrees C (25 µA), a total meter circuit resistance of 4.8k ohms. The internal resistance of the meter is 1.3k ohms so we need a 3.5k ohms in series, which is supplied by trimpot R9.

The center scale meter circuit has a switch so it may be turned off when not wanted, as when you might care to measure a temperature variance of more than 35 degrees C when you are not closely monitoring.

Due to the constant-current circuits, the supply voltage may well be any from plus twelve volts to a plus twenty-four volts with no appreciable difference.

Figure 2 (Photo C)

If you do not have a 0–100 µA meter, you can make a smaller, still handsome, unit if you have a center scale microamp meter and a ten-turn precision pot with a digital readout dial … or the analog ten-turn dial.

This circuit is similar to the Fig. 1 circuit, but with only a center scale meter required, a microamp meter should be used — but any sensitive meter will suffice as the meter is only used for nulling purposes. The meter I had handy was a 50-0-50 µA unit.

The sensor diodes have been increased to three to provide a bit more sensitivity of the meter adjustment. When installing the ten-turn dial to R7, be sure to turn both to their full counterclockwise position; then tighten the dial screws. When the pot is full counterclockwise, the dial should read zero. Clockwise rotation of the dial should move the movable contact towards R8.

If you have an ambient temperature near zero degrees C, disconnect, temporarily, the connection between M1 and R7. Now write down the ambient temp and the voltage of the sensor. If the temp is a few degrees above zero degrees C, extrapolate what the voltage would be at a positive 6 mV per degree variance down to zero degrees C. In my case, my zero sensor voltage figured out to be 2.125 volts. R7 must span 100 degrees C, which would be a total sensor voltage change of 600 mV. R7 being 500 ohms, that means we desire to set the current through it at 1.2 mA. When the dial reads 1,000, the sensor voltage should be 1.525 volts, which means trimpot R8 should be adjusted to 1.271k ohms.

Parts for Fig. 1 (Photo B)		Parts for Fig. 2 (Photo C)	
Name	**Description**	**Name**	**Description**
D1, D2	6.2 V zener, 1 W	D1	6.2 V zener, 1 watt
D3	4.1 V zener, 1 W	D2	1N914
D4, D5	1N914	D3	4.1 V zener, 1 W
D6	LED	D4	Red LED
D8	1N825	D5, D6, D7	1N649 sensor
D9, D10	1N649 sensor	D8	1N825
M1	Meter, 25-0-25 µA, end scale, 1.3k, 30-0-30 end scale reading	M1	Meter, 50-0-50 µA, center scale, 860 Ω
M2	Meter, 100 µA, 1.3k	R1	2.7k, 1/4 W, 5%
Q1, Q2, Q3	2N2905	R2	390 Ω, 1/4 W, 5%
R1	560 Ω, 1/4 W, 5%	R4	560 Ω, 1/4 W, 5%
R2	1.5k, 1/4 W, 5%	R5	5.1k, 1/4 W, 5%
R3	1.2k, 1/4 W, 5%	R6	5k trimpot
R4	160 Ω, 1/4 W, 5%	R7	500 Ω 10T wirewound, 3/4 in. w/ dig. readout counter
R5, R6, R7	5.1k, 1/4 W, 5%	R8	2k trimpot
R8, R11	500 Ω 10T 3/4 in.	T1	3-way terminal, red
R9, R10	5k trimpot	T2	3-way terminal, black
SW1, SW2	DPST mini toggle	—	—
T1	3-way terminal post, red	—	—
T2	3-way terminal post, black	—	—

Table 1. Parts list for 0–100° C thermometer with variance set.

Continued on page 54

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Going Over a Gonset G-77

A transmitter from the old days (well, 1957) gets tested and evaluated.

Gonset equipment for ham radio applications has always been very dependable and easy to use. It's rare to find a fault with any of the Gonset designs that were produced as each was tailored to meet a ham application. Although I own several pieces of Gonset equipment, I'd not worked with a G-77 transmitter until my friend Johnny WB6HYR asked me to test and evaluate his unit.

Only after obtaining a copy of the operator's manual did we discover that the companion modulator-power supply was missing. At first it was thought that the transmitter package contained all that was required for a complete unit. But since it didn't, the transmitter evaluation continued as planned by applying power from my bench supply.

The G-77 transmitter, shown in **Photo A**, was designed and delivered to the ham community during the 1957 era when amplitude modulation (and CW) was still the mainstay for ham communications even though SSB was on the rise. The G-77 was designed exclusively for mobile operation and covered five ham bands from 3.5 to 29.7 MHz at a power input of 50-60W using a 6146 tube in the final amplifier. With a pi-tuned output, the transmitter would accommodate most any mobile antenna/feedline impedance requirement with 50 ohms being the nominal value.

At the time of design, automotive electrical systems were still in the transition from 6 volts to 12 volts. Although most new cars at that time were 12 volts, a lot of 6 volt system vehicles were still in existence. As delivered, the G-77 transmitter and power supply had internal jumpers set for a 12V system, but could be changed to accommodate a 6V system.

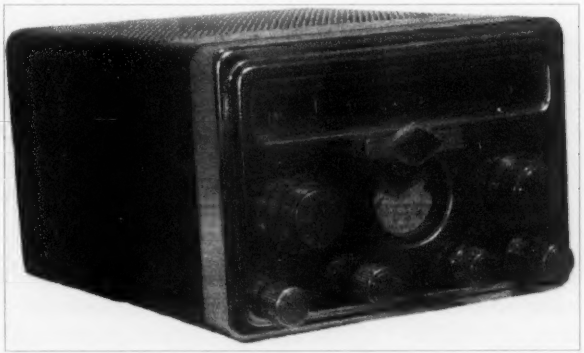

***Photo A.** This is a front panel view of the Gonset G-77 low band mobile transmitter.*

Photo B shows the internal physical placement of the oscillator and multiplier tubes. A 6CL6 tube is operated as either a VFO or as a crystal-controlled oscillator. A 6CM6 is used as a buffer/multiplier following the oscillator. For the 80m band, the frequency of operation is between 3.5 and 4.0 MHz, and for the remaining bands, the oscillator operates in the region of 7 MHz with the 6CM6 multiplying the frequency up to the selected band. During my evaluation, I found the VFO to be very stable. However, I did note some microphonic tendency when the chassis received sharp blows that were in excess of typical vehicle vibration. Therefore, I assume the crystal-controlled option was available for a fixed frequency net operation and not strictly for reducing microphonics.

Bench power

To perform an evaluation of the transmitter, I applied power from my bench supply that provided 12VAC for the heaters and 0-250VDC for the B+ circuits. However, the PTT relay required 12VDC if it was to be operated — more on that in a moment.

When in normal mobile operation, the transmitter and power supply were idle during receive in order to conserve battery power. But the issue

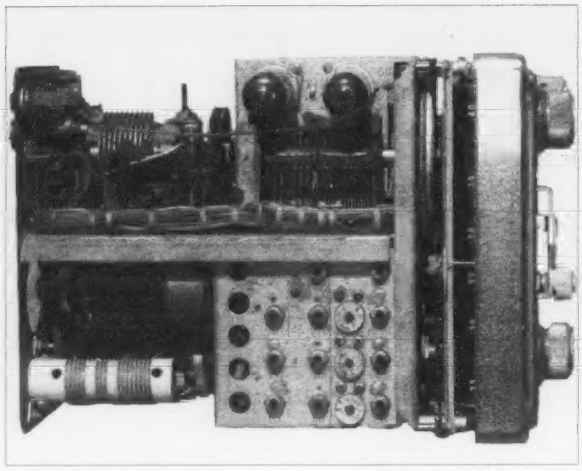

Photo B. *This photo shows the placement of the oscillator, frequency multiplier and PA tubes.*

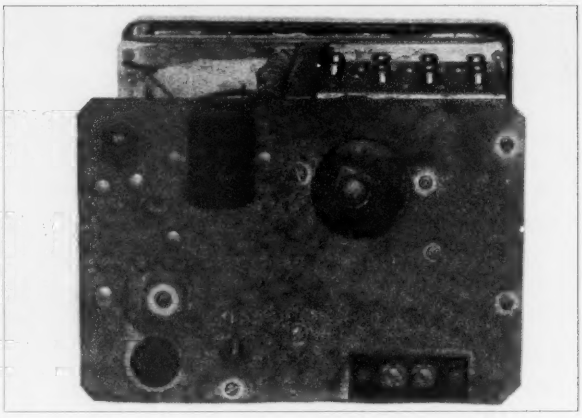

Photo C. *This is a rear panel view of the transmitter showing the various connectors. Take note of the Jones power connector, antenna connectors, and the terminals for optional low band loading capacitance.*

during bench testing was how the PTT was configured to accommodate a rapid turn-off of the transmitter during the transition from transmit to receive. By design, one set of contacts of the PTT relay short the B+ line, through a resistor, to ground with the intention of quickly killing the oscillator during the transition.

Therefore, to apply bench power to the transmitter, I had to either apply 12VDC to the PTT relay to switch it, or to mechanically move the relay contacts into the transmit position. I chose the latter approach and slipped a piece of folded paper between the upper contacts forcing the relay armature downward. The benefit was two fold: The short was removed from the B+ line, and the antenna coax connector was connected to the pi-tuned output circuit — the transmitter was now in a "transmit" mode.

To test the transmitter, I decided to apply power in two steps with the first involving only the oscillator and multiplier circuits. The second step would activate the power amplifier once the oscillator and multiplier circuits were found to be functional.

Photo C shows the Jones connector that is mounted on the back of the transmitter where all power is applied. In the absence of a mating connector, I chose to use short lengths of #20 bare copper wire to lend access to the socket pins. To start, a wire was slipped into pins 10 and 11 to pick up the B+ lines for the oscillator and multiplier — I applied 175-200V.

Later, when the power amplifier was activated, the wire lead ends of a 15k 2W resistor were slipped into connector pins 5 and 8. A high voltage of 175-225V was then applied to B+ pins 5, 10, and 11 (the 15k resistor applied power to pin 8). The purpose of the 15k resistor was to drop the screen voltage to a value well below the voltage on the plate of the 6146 PA tube.

Alignment/tracking

During my checkout of the transmitter, I found only two problems that required attention. The first was a lack of lubrication in the gears and shaft bearings. Lubrication of the gears and shaft bearing was done using a light weight machine oil. Because of the age of the equipment, the switch wafer contacts were sprayed with TV tuner cleaner to remove the oxides. The second problem was the alignment error between the actual frequency generated and the indicated dial marking.

The error involved the band of generated frequencies that exceeded the indicated dial range — this was a tracking error, not just an alignment offset error. Tracking alignment involves measuring the generated output frequency with a frequency counter or with a calibrated receiver and comparing the frequency to the dial marking as the dial is rotated from one end to the other. If the generated frequency band is wider or narrower than the dial's band marking, then a tracking error exists.

An alignment error would be as simple as an offset in frequency generated from the dial's indicated frequency. The 10m ceramic trimmer capacitor, as discussed shortly, is used to make minor frequency VS dial alignment adjustments. NOTE: This capacitor's adjustment affects all bands, not just the 10m band.

Tracking is controlled by the values of inductance (L) and capacitance (C) that exist in the tuning circuit. The width of the tuned band is controlled by the ratio of L to C values. As an example, if the band of frequencies generated is wider than the dial markings, then the value of C must be increased and the value of L must be decreased in order to narrow the generated band of frequencies. Because of the interaction between the L and C adjustments, the generated frequency and dial's band edge markings must be compared after every adjustment until the frequency and the marking match.

NOTE: I had a problem measuring the oscillator and multiplier output frequency when using a frequency counter during the oscillator/multiplier tests. Only after the PA was energized did the counter begin to reliably indicate the correct frequency. Even though the counter's detected signal

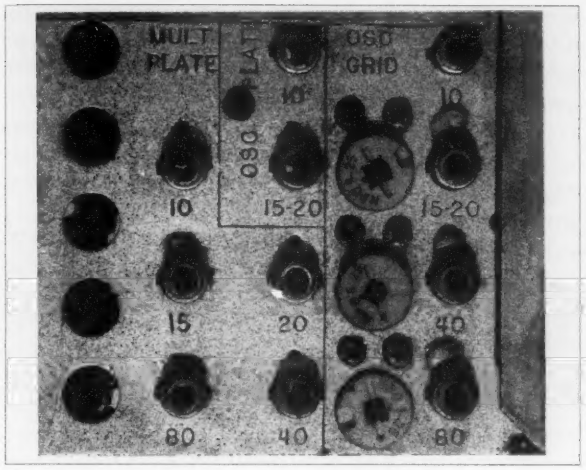

Photo D. *Tracking and alignment is performed by adjusting only the L and C values shown in the "OSC GRID" section. All remaining adjustments are left untouched.*

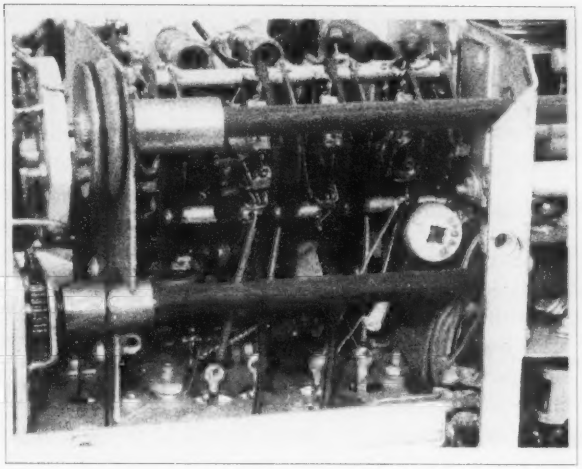

Photo E. *During tracking alignment, the ceramic trimmer capacitor shown mounted on the band switch wafer is the C value that is adjusted for the 10m band.*

level appeared to be sufficient while probing the multiplier plate coils, the counter failed to provide a stable frequency indication. After trying several antenna and loop pickup techniques, I finally gave up on the counter until the PA was energized. To make valid and reliable frequency measurements during the tracking adjustments, I used a digitally synthesized receiver that tuned 80m through 10m.

Before performing a tracking adjustment, it was necessary to identify where each L and C component was located for each band. **Photo D** shows the marked metal panel that holds the majority of the band L and C components. To perform tracking adjustments, only the "OSC GRID" L and C values were touched. I found no need to touch the remaining adjustments on the panel. Alignment was performed first with the 10m band and working down to the 80m band as the last one. The reason for starting with the 10m band is that the C component for the 10m band is fixed across the main tuning capacitor and the adjustment will affect all other bands. Physically, the 10m C component is located on the underside of the chassis and is soldered to a band switch wafer as shown in **Photo E**.

In general, the technique required to perform a tracking alignment is as follows:

1) Adjust the dial to the highest indicated frequency and take note of the generated frequency. It's important to place the dial pointer to the same mark as accurately as possible with each subsequent setting.

2) Adjust C to shift the measured frequency to that of the dial marking.

3) Rotate the dial to the lowest dial frequency and take note of the generated frequency. Using a plastic hex tuning tool, adjust the L value to shift the measured frequency to that of the dial marking.

4) Because of the L and C interaction, switching back and forth between dial band edges is required until the generated frequency matches the dial marking.

Unfortunately, there may be some disparity between the mid-dial marking and the generated frequency even though the dial ends track. In such a case, some compromise may be desired to average the "dial" error at selected dial points. Minor adjustment of the L and C values will provide the compromise. Repeated checking between the mid and end frequencies must be done until the desired compromise has been achieved.

Powering the PA

Before applying power to the PA circuit, the 50-ohm dummy load was attached to the antenna coax connector. I had an in-line power meter ahead of the dummy load as a power output monitor. In addition, I had a field strength meter near the transmitter so that I could observe any RF output from the transmitter because the FS meter is more sensitive to an RF level than the power meter. B+ to the transmitter was raised slowly in order to make sure there were no power shorts in the PA circuit and to make sure the tuning adjustments were close to resonance as the voltage was increased.

At one point, the folded paper that I'd wedged into the PTT relay contacts apparently relaxed, disconnecting the load from the pi-network. The transmitter worked fine after fixing that minor issue. All of the normal operator controls were functional. With about 200V on the B+ line (Jones connector pins 5, 10, and 11) and with the PA operating, the frequency counter was now indicating a valid output frequency.

To keep tube dissipation to a minimum during tune-up, adjustments to the PA were done quickly to achieve resonance. Fortunately, the G-77 tunes easily with a fairly broad response making adjustment quite easy. Once resonance is achieved with the plate tuning capacitor, the output loading capacitor may be adjusted incrementally, along with the plate tuning, to transfer the greatest amount of power to the load. With only 175V on the plate of the PA, I hadn't expected to see much output power and was surprised to see between 8–9W showing

on the power meter. If you assume a 60% efficiency, the input power was probably in the 20W range. I suspect that with 500V applied to the PA plate, the transmitter is capable of 60W input power.

Modulator–power supply

The companion modulator–power supply for the G-77 was designed for use with either a 6V or 12V automobile system. Because the drawing as obtained was of poor quality, I took the liberty of drawing in some missing lines, etc., to make the image more useful.

Fig. 1 shows a schematic of the modulator–power supply that is of better quality after some repair work was done to enhance it. (Unfortunately, the schematic for the whole rig is not so salvageable, and barely readable.) The design uses a synchronous vibrator to chop the DC input power to create AC required by the power transformer. The transformer's output drives a halfwave voltage doubler creating both +250V and +500V for the transmitter. An 0A2 VR tube obtains power from the +250V source to provide a stable +150V for the oscillator.

One of the unique features of the Gonset mobile supply design is the use of relay RL2, whose purpose is twofold: 1) to hold off applying HV to the PA until the 500V value has reached nearly the maximum value, and 2) to reduce the surge current through the rectifiers during the charge time required by filter capacitor C303. To achieve the required time delay, resistor R216 was selected to limit the relay coil current until the applied power supply voltage approaches an operating level.

The modulator portion of the system is pretty much a straightforward high power audio amplifier capable of producing AF power approaching 35W. Circuit values have been selected to provide an audio pass band within the range of 300–3000 Hz. Sufficient feedback is provided to reduce the tendency for audio distortion and excessive peak modulation.

Continued on page 54

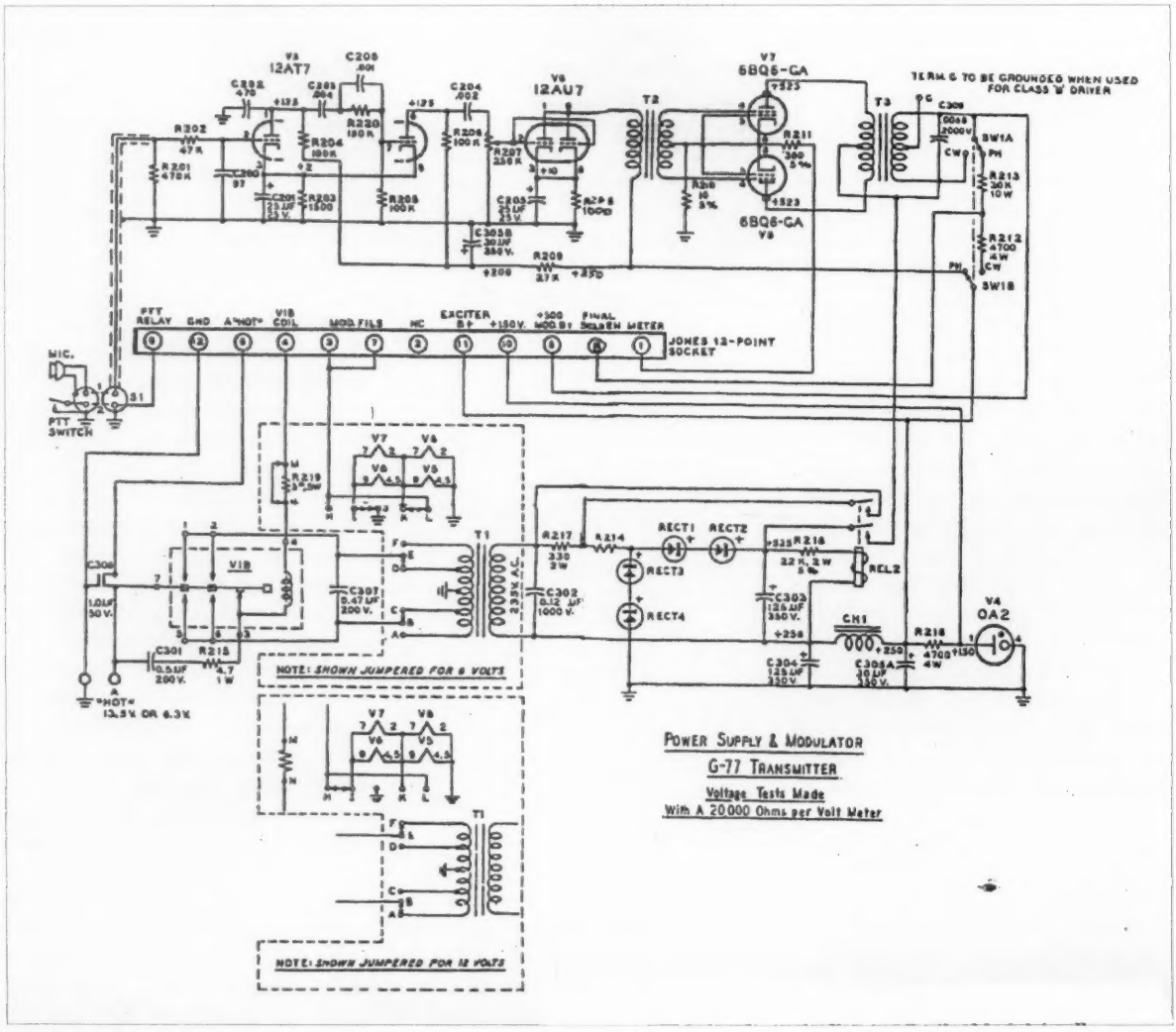

Fig. 1. Modulator–power supply schematic.

Dan Metzger K8JWR
6960 Streamview Dr.
Lambertville MI 48144-9758

Read All About It!

Part 12 of good stuff from The Hertzian Herald.

Ten More Tech Tips, Capacitor Capers, and The Old Man.

Here, without further ceremony, is another batch of tech tips that I hope you will find useful.

1. Wrap a few inches of solder around the cord of your soldering pencil or gun. You'll be glad you did when you find you've left your solder roll in the basement and you're on the roof!

2. A piece of brown paper grocery bag is usually just abrasive enough to remove the dirt from your key contacts without damaging the metal surface. Files and emery papers can do permanent damage to the contacts.

3. Never leave a VOM on the OHMs ranges. This can cause a continuous drain on the battery, possibly resulting in leakage of battery acid and destruction of the VOM's circuit board.

4. Sometimes a volume control or other potentiometer goes intermittent because the wiper isn't making good contact on the carbon track. Try pulling on the knob as you rotate it. If this helps, you may be able to keep a permanent "pull" on the shaft by wrapping and twisting a no. 24 bare wire around the shaft between the mounting threads and the shaft C-clip.

5. A good cutting pliers should snip a piece of paper as cleanly as a scissors, or nip a hair off the back of your hand without you feeling a pull. Hold it up to the light: The jaws should mesh so well that you can't see light between them.

6. The tip of a long-nose pliers should mesh first, then as more pressure is applied the jaws should mesh further back. Try picking up a scrap of paper with the tip using a light grip. Then try holding a narrow strip about 1/2 inch back from the tip with a firm grip.

7. One of the most useful tools in your kit (and the hardest to find) will be a small steel-wire brush, with bristles about 3/4-inch long in a bundle about 1/8-inch in diameter. You see, the most common cause of difficulty in soldering is a tough oxide coating which forms on the surface of some metals. Rosin flux can't dissolve the more stubborn coatings to let the solder through, but a good scrubbing will take it off. If the surface is smooth you can scrape the oxide off with a knife.

8. The second most common cause of soldering difficulty is not getting the work hot enough to get the solder to bond to it. Heat the work with the pencil, but melt the solder with the work, not with the pencil. That way you're sure the work is hot enough. I apply the pencil to one side of the work, and the solder to the other side.

9. Got to get a drop of light oil down into a tight place? Bend a few inches of stripped hookup wire so its end reaches down to the spot needing the oil. Then put a drop of oil at the top of the wire and watch it run down to the tight spot.

10. When troubleshooting, play the odds — check the most likely sources of trouble first. Here's the list, from most-likely to least-likely trouble areas.

(a) Operator error. Have the operator run the unit while you watch.

(b) Connectors, cables, and sockets. Wiggle, flex, and jiggle to locate faulty connections.

(c) Switches, motors, and relays. Clean the contacts.

(d) Power resistors, transformers, transistors, and diodes. Heat destroys.

Continued on page 38

Reprinted with permission from *The Hertzian Herald*, newsletter of the Monroe County (MI) Radio Communications Association (MCRCA).

Read All About It!

continued from page 37

(e) Electrolytic capacitors. Tantalum electrolytics are more reliable than aluminum ones.

(f) Small transistors, diodes, ICs, and coils. Transistor and IC sockets fail far more often than the devices themselves.

(g) Non-electrolytic capacitors. Occasionally you'll find an open one, or one that leaks DC, but not often.

(h) Small resistors. It's rare to find a failure here, unless a failure somewhere else has caused excessive heating of the resistor.

Capacitor capers

Choosing a capacitor for amateur applications often involves a little more than just getting the number of microfarads right and making sure the voltage rating is at least as high as required by the circuit. Take aluminum electrolytic capacitors, for example. Manufacturers don't like to advertise it too widely, but the better ones have a tolerance of ±20% — and that's at room temperature. At 0 degrees F the capacitance is likely to drop by another 20%, so that "100 µF" electrolytic may end up having a value of 60 µF!

On the other hand, some electrolytics have a tolerance of –20/+80%, so a unit marked 100 µF may actually be 180 µF. A few are marked "GMV" (guaranteed minimum value) — so the actual value may be anything above the marked value. Using an aluminum electrolytic in a timing or frequency-determining application is generally not good practice, unless you are prepared for variations on the order of a factor of two either way. Tantalum electrolytics, although more expensive, are available with tolerances of ±10%, and they have value changes at 0 degrees F on the order of –10%, so they may be acceptable.

At radio frequencies, the losses in most capacitor dielectric materials become severe. Mylar, polycarbonate, and ceramic types are generally not suitable above 1 MHz if the RF across them is going to be more than a volt or so. I have seen ceramic capacitors in the output network of a QRP transmitter get warm to the touch, indicating a serious waste of power. We're talking less than 20 V rms at 7 MHz. Polystyrene capacitors fare rather well at high frequencies, micas are better, silvered micas better still, and air-dielectric capacitors are best of all.

Capacitor markings can be quite cryptic. Usually a three-digit number that ends in something other than a zero is telling you the first-digit, second-digit, and a multiplier, with the final value in picofarads. Thus 471 means 470 pF, and 223 means 22 000 pF, or 0.022 µF.

Tolerance is often given after the value by a letter code. Here is the decoding chart:

F = ±1%
G = ±2%
H = ±3%
J = ±5%
K = ±10%
M = ±20%
Z = –20/+80%
P = –0/+100% (GMV)

Thus, a capacitor marked 104K is not 104 kilofarads, but 10 0000 pF (or 0.1 µF) with a tolerance of ±10%.

To add to the confusion, ceramic disk capacitors may have a three-character code following the value and tolerance code. The first character is a letter specifying the low-temperature limit:

X = –55 deg C
Y = –30 C
Z = +10 C

The second character is a number specifying the high-temperature limit, in degrees Celsius:

5 = +85 C
7 = +125 C

The third character tells the maximum capacitance change (in percent) over the temperature range given by the first two characters:

A = ±1
C = ±2.2
E = ±4.7
P = ±10
R = ±15
S = ±22
T = +22, –33
U = +22, –56
V = +22, –82

Thus, a capacitor marked "333M Z5S" has a value of 33 000 pF, or 0.033 µF, and a tolerance of ±20%, and may be used over a temperature range from +10 to +85 C with a capacitance change not more than ±22%.

L-C oscillators generally tend to drift down in frequency as the equipment warms up. This is due largely to thermal expansion of the coil form. To compensate for this drift, special ceramic capacitors may be used whose value decreases with increasing temperature. This negative temperature coefficient is indicated by the letter N followed by a number giving the capacitance decrease in parts per million per degree C. For example, a capacitor marked 180 N750 has a capacitance of 180 pF, and as the unit warms up from 20 C to 50 C (68 F to 122 F) this value may be expected to decrease by

30 x 750 / 1 000 000 = 0.022 = 2.2%

Ceramic capacitors specifically designed to have zero capacitance change with temperature are marked NPO (Negative/Positive: Zero).

The Old Man

The guy they called The Old Man? Sure, I knew him. Well, it wasn't actually me — it was my buddy, Al. I think his family knew him from way back. However it was, three or four times during our sophomore and junior years of high school Al called me to say that he had been invited to The Old Man's shack because he "wanted to talk" — and would I like to come along.

The Old Man's shack was a two-car garage, partitioned into operating room, workshop, and storage area in about the proportions of 1-to-2-to-3. His rig consisted of three six-foot relay racks full of what appeared to be home-brew exciters, amplifiers, modulators, and power supplies. The rig was dark and silent, and he never turned it on while we were there. In fact, I never heard him on the air, and later, when I got home and looked up his call in the *Callbook*, it wasn't there.

His receiver, a Collins 75A-2, was always on, with CW signals mumbling softly in the background. Once, while

Continued on page 54

By Eric Shalkhausser W9CI, SK

The History of Ham Radio

Part 14: The Hoover era comes to an end.

Radio conferences, now commonly referred to as the Hoover Conferences, became yearly affairs and the assembly of 1925 was no exception. The conferences were called to bring about a degree of cooperation between various branches of the developing radio industry.

Primarily to cope with the ever-increasing proliferation of interference problems in the interest of the listener and to mediate the differences between broadcast license applicants, government regulation became of paramount importance.

This, the fourth conference, was to be the last one called by the Secretary of Commerce. Radio's destination would be completely revolutionized in the subsequent two years by bringing about the needed legislation to replace the 1912 law.

Convening in Washington on November 9th, 1925, some 700 participants from all sections of the United States were present — and only for three days. They soon came to unanimous agreements on all major issues. The spirit in which various questions were approached signified common understanding of the direction which radio broadcasting was to take in the future.

Reprinted from *73 Magazine for Radio Amateurs,* May 1981, where this was originally reprinted from *QCC News,* a publication of the Chicago Area Chapter of the QCWA.

By the end of 1925, there were some 600 radio broadcast stations operating in the United States with no enforceable regulations. The opinions of the conferees were practically unanimous in favor of not limiting the number of broadcasting licenses issued, but actually to diminish the stations on the air so that the radio listener would benefit from the reduced interference generated.

What was the radio amateur's position? At the conference, the question of greatest interest to amateurs concerned the retention of the 150- to 200-meter band. Its takeover was threatened by the broadcasters. However, after serious consideration, no additional channels were allocated for the broadcast service.

Several recommendations were promulgated for the amateurs:

1. The opening of a 100 kHz band from 83.3 to 85.7 meters (3,500 to 3,600 kHz) to amateur phone operation, the usual quiet hours applying.

2. The opening of the so-called amateur 80-meter band to naval aircraft.

3. The prohibition of spark to all waves below 200 meters.

These recommendations were to take effect after formal announcement by the Department of Commerce. Meanwhile, the regulations of the past year remained for amateur guidance.

Mr. Hoover, in his opening remarks at the conference, referred in particular to the progress radio had made during the few years of development.

"It has been suggested that the remedy [for congestion] lies in widening the broadcasting band, thus permitting more channels and making it possible to provide for more stations. The vast majority of receiving sets in the country will not cover a wider band. Nor could we extend it without invading the field assigned to the amateurs, of whom there are thousands and to whom constant experimentation in radio development is so greatly indebted. Radio in this branch has found a part in the fine development of the American boy, and I do not believe anyone will wish to minimize his part in American life. And if we did absorb the higher amateur band from 150 to 200 meters, it would not even solve the immediate difficulties ..."

The conference went on record recommending the following:

1. That no new stations be licensed until, through discontinuance, the number of

Continued on page 55

Calendar Events

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the February issue, we should receive it by November 30. Provide a clear, concise summary of the essential details about your Calendar Event.

NOV 1, 2

ODESSA, TX The West Texas ARC will host their 2002 Hamfest on Friday and Saturday, November 1st and 2nd, at the Holiday Inn Center, 6201 E. Hwy. 80, Odessa TX. Hamfest hours will be 5 p.m. to 9 p.m. on Friday, and 8 a.m. to 5 p.m. on Saturday. VE exams will be available. Plenty of free parking spaces. Admission $3, tables $10 with one free ticket per vendor. For more info contact *Craig Martindale W5BU, 1719 Rosewood, Odessa TX 79761.* Phone *915-366-4521* or E-mail to *[w5bu@arrl.net].*

NOV 9

MONTGOMERY, AL The Montgomery ARC will host the 25th annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair grounds located on Federal Dr. in the Northeastern section of historic Montgomery. Admission is $5, free parking. Inside flea market set up 3 p.m. to 8 p.m. Friday evening, November 8th; and 6 a.m. to 8 a.m. November 9th. Doors open to the public from 9 a.m. to 3 p.m. CST. VE exams on site beginning at 8 a.m. Testing by CAVEC. Bring original and a copy of your current license, picture ID, and $3 fee. Talk-in on 146.24/.84, W4AP. Ragchew on 147.78/.18 with phone patch *up/#down, 449.50/444.50, and 449.45/444.45. Flea market reservations are required to assure tables. Tailgaters welcome at $2 per vehicle space. For more info write to *Hamfest Committee, c/o 7173 Timbermill Dr., Montgomery AL 36117-7405;* or phone *Phil* at *334-272-7980* after 5 p.m. CST. E-mail *[k4ozn@arrl.net].* For late breaking news and events, visit *[http://jschool.troyst.edu/~w4ap/].*

NOV 16

NEWTONVILLE, MA The Waltham ARA and the 1200 RC will sponsor an Amateur Radio and Electronics Auction, 11 a.m.–4 p.m. at Newton Masonic Hall, 460 Newtonville Ave., Newtonville MA. Talk-in on 146.640. Admission $2. Door prizes, snack bar. For directions and more info, visit the Web at *[http://www.wara64.org/wara/auction.htm];* or contact *Eliot Mayer W1MJ, 24 Hamilton Rd., Belmont MA 02478.* E-mail *[w1mj@amsat.org],* or phone *617-484-1089.*

NOV 16, 17

FORT WAYNE, IN The 30th Annual Fort Wayne Hamfest & Computer Expo, sponsored by the Allen County Amateur Radio Technical Society (AC-ARTS), will be held at the Allen County War Memorial Coliseum at the corner of Indiana 930 (Coliseum Blvd.) and Parnell Ave. Open to the public 9 a.m.–4 p.m. EST on Saturday, and 9 a.m.–3 p.m. EST on Sunday. Vendor setup is Friday evening and Saturday morning. Admission is only $5 (good for both days) at the door ONLY. Parking is $3. There will be 1,000 commercial and flea market tables all under one roof, containing both new and used radio, computer, and general electronics items. The guest speaker this year will be FCC Special Council for Amateur Radio Enforcement, Riley Hollingsworth. Dick Isely W9GIG, ARRL Central Division Director, will be providing a forum; and Dan Henderson N1ND, ARRL Contest Branch Manager, will also be present. Vendors include several international ham equipment manufacturers. Activities will include many forums and meetings, and VE exams on Saturday. Shuttle bus service will be provided to and from the commuter airport (Smith Field) and shopping centers. Talk-in on 146.88(-). For more info, leave a message on the answering machine at *260-484-1314,* and you will be contacted. You can also send an SASE to *AC-ARTS/ Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851-0342;* or visit the Web site at *[http://www.fortwaynehamfest.com].*

NOV 30

EVANSVILLE, IN The Evansville Winter Hamfest will be co-sponsored by Electronic Applications Radio Service, Inc., and The Ham Station. Everyone is invited to attend this event which will be held 8 a.m. to 2 p.m. Central Time, at Vanderburgh Co. 4-H Fairgrounds Auditorium in Evansville. Admission only $5. Talk-in on EARS Wide Area Repeater Network 145.150(-) Evansville or 146.925(-) and 443.925(+) Vincennes (all use 107.2 tone). Backup on 145.110(-) Evansville, tone 107.2. ARRL-VEC exams will be held at 12 noon. Plenty of commercial vendors and indoor flea market space. Free tailgating with admission ticket (weather permitting). Breakfast and lunch will be served by Old Post ARS. For more info visit the Web site at *[http://w9ear.org].* 8 ft. tables are $8 each (includes chairs). Wall tables (while they last) are $10 each. Add $2 per table if payment is received after November 15th. Setup times: 5 to 9 p.m. Friday; 6 to 8 a.m. Saturday (all times Central). For table reservations or info, contact *Neil WB9VPG* at *812-333-4116* or *812-327-0749;* or write to *Neil Rapp, 2744 Pinehurst Dr., Bloomington IN 47403.* E-mail *[ears@ w9ear.org].* 73

Never Say Die

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is the only water that can be taken into the body without damage to the tissues. Distilled water is water which has been turned into vapor, so that all its impurities are left behind. Then, by condensing, it is turned back to pure water. It is the only water which is pure — the only water free from all impurities."

Dr. Charles Mayor of the Mayo Clinic: "Water hardness (inorganic minerals in solution) is the underlying cause of many, if not all, of the diseases resulting from poisons in the intestinal tract. These minerals pass through the intestinal walls and get into the lymphatic system, which delivers all of its products to the blood, which in turn distributes them to all parts of the body. This is the cause of much human disease."

Dr. David Kennedy, D.D.S., wrote: "Even tap water invariably contains a variety of poisons such as chlorine, chloramine, asbestos, pesticides, fluoride, copper, mercury, and lead. The best way to remove all these contaminants is by distilling."

One of the best buys I've found is the $119 still from NutriTeam Distillers, Box 71, Ripton, VT 05766, 800-785-9791. Or check [www.steamdistiller.com].

Club Talks

Well, it's taken a while, but I'm finally

Continued on page 58

ABOVE & BEYOND

VHF and Above Operation

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Constructing a 1296 MHz Omni Slot Antenna

Last time, we described the use of N connectors as the better choice for operation over 1 GHz, rather than the UHF connector. Also shown were the methods for using a directional coupler to measure forward power, reducing high power RF to a lower value, allowing lower power attenuators to measure higher power transmitters, and reversing the directional coupler to make SWR/return loss measurements.

The SWR/return loss measurements are used to properly adjust an antenna and bring it into agreement at the frequency of operation for best transfer of power from the transmitter to the antenna, with a minimum of power being reflected back towards the transmitter — i.e., best SWR/return loss means maximum power being radiated by the antenna.

The SWR measurements are the same whether it is at a frequency of 4 MHz or 1296 MHz; it's just that the tools look a little different. You could use a directional coupler at 4 MHz, but the device would be quite large in respect to one for 1296 MHz. As frequency is increased, the wavelength factor gets smaller, making devices for higher and higher frequencies smaller compared to their associated wavelength.

SWR vs. return loss details are as follows: If the SWR is 3:1, then the return loss is 6 dB. If 2:1, then 9.5. If 1.5:1, then 14. If 1.3:1, then 17.5. If 1.1:1, then 26.

Construction of an antenna for 1296 MHz presents several problems, and while there are many yagi-type designs and other types, they require exacting construction be followed to deliver a quality device. While a directional antenna is very desirable, I wanted to have an omnidirectional antenna to be able to work my local friends easily and see what is going on with 1296 MHz. Also, I wanted a design for the antenna that I could follow and construct with my drill press and hack saw and files. I had to violate this rule a bit.

The omni design, I discovered, was an adoption of several designs by both British and U.S. amateurs and their approaches to construction. I don't take credit for the original material, just for the dimensions in my finished product. This was started with the main tubing, which proved to be of a nature that I could not find a comparable diameter tube in thinwall brass standard tubing U.S.-made, compared to the British metric equivalents. A search of other construction articles gave me some confidence to continue onward and attempt construction of the Alford slot antenna.

In the construction of the 1296 MHz Alford slot antenna we located a section of brass tubing from an all-service hardware store, San Diego Hardware. This store is quite unique, as it stocks many hard-to-find items, besides a great selection of quality tools in every size and shape. I have never seen a store have so many different sizes of screwdrivers, as well as precision and specialty items such as taps, dies, and even washboards. Quite a unique store — a must if visiting San Diego. We purchased a 6-foot section of 1-1/4 inch brass tube stock, enough material to construct two slot antennas. See **Fig. 1** for slot antenna details of construction.

The design specifications were confusing, as the original construction article used metric dimensions and presented problems in finding stock of proper wall and diameter sizes. We selected the 1-1/4-inch brass tube as a compromise, and took a few other liberties with slot width and length variations of the antenna.

The best description of the antenna I can make is that it is a slot cut into the front side of a round tube. The extra slot length is used to advantage to allow exact frequency adjustment when tuning the antenna. Feeding the antenna balanced in the center is accomplished with a length of 141, 50 ohm hard-line coax slightly longer than the antenna. One end of this 141 hard-line is cut into a balun of one-quarter wavelength which feeds the center of the slot by being soldered to it. The balun as constructed has

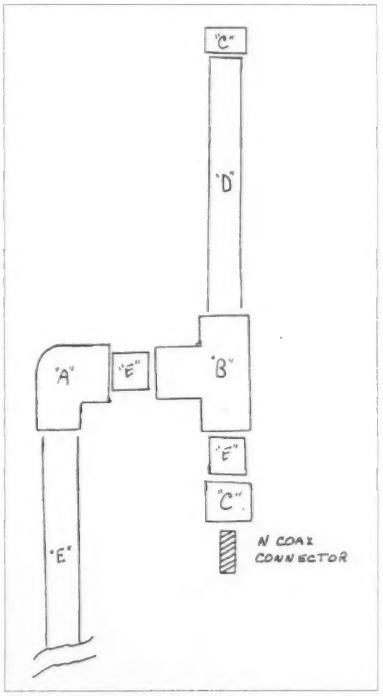

Fig. 1. *Showing full omni slot antenna that Kerry N6IZW and I constructed including PVC pipe mount using excess remainder of the inch and one quarter PVC schedule 40 pipe length as a mast to attach to the 90 degree plumbing elbow. A = 90 degree SCHD 40 1-1/4" elbow. B = SCHD 40 1-1/4" "T". C = SCHD 40 1-1/4" end cap. D = 1-1/4" fluorescent light shield "tube guard." E = SCHD 40 1-1/4" PVC pipe.*

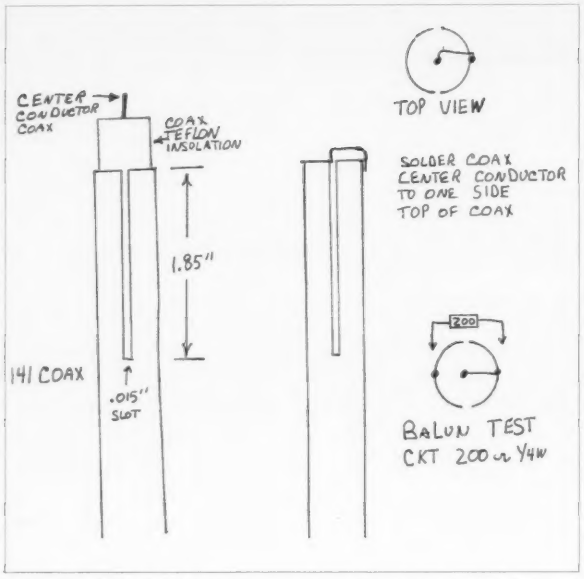

Fig. 2. 200 ohm balun construction using a length of 0.141 solid copper coax. Length of 0.141 coax should be long enough to attach balun and make connection to coax connector at bottom of antenna. Balun slot length should be 1.85 to 1.9 inches long.

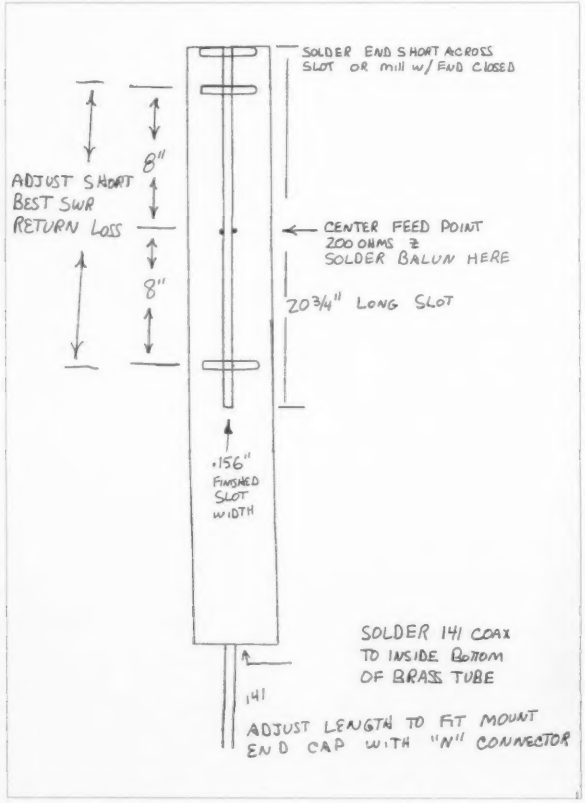
SOLDER END SHORT ACROSS SLOT OR MILL W/ END CLOSED
8"
ADJUST SHORT BEST SWR RETURN LOSS
8"
CENTER FEED POINT 200 OHMS ± SOLDER BALUN HERE
20 3/4" LONG SLOT
.156" FINISHED SLOT WIDTH
SOLDER 141 COAX TO INSIDE BOTTOM OF BRASS TUBE
141
ADJUST LENGTH TO FIT MOUNT END CAP WITH "N" CONNECTOR

Fig. 3. Slot antenna construction. Note top end of brass tube has short on end. Second short determined when frequency measurements for 1296 made and short placed 8 inches above center feed balun on antenna I constructed. Bottom short same scenario as top short and adjustment short spacing, 8 inches in my construction test.

impedance of 200 Ohms. (See **Fig. 2** for balun construction details.) If you want to test the balun for operation, solder a 200 Ohm 1/4-watt carbon resistor on the balun end and take a return loss/SWR measurement at frequency of operation 1296 MHz. You should see a 15 dB return loss or better or SWR of 1.5 to 1 or less.

The balun is routed to the rear of the 1-inch tube to eliminate its affecting the slot by being close to it as it is routed out the bottom of the antenna. Construction of the balun is to cut front and backsides of the outer solid copper shell of the 141 coax cable 180 degrees apart, forming two distinct one-quarter wavelength sections of coax; we will call them leaves. Before cutting the balun I removed one-half-inch of outer copper from one end of the 141 coax and left the inner Teflon protruding on the end of the cable. Use a longer section of 141 coax so that if your cut fails to be accurate, or you want to do it over, you have the length of 141 coax to accommodate the feed. Better longer than shorter.

To make the balun slot cut, I used a Dremel tool with a cutting wheel that was 0.015 inch thick. I marked the length of the quarter wavelength balun slot at 1.85 inches and held the coax in a vise to eliminate movement, and while wearing safety glasses I cut each side of the 141 coax slit with the Dremel tool. Try to not cut into the Teflon center insulator — do the job slowly and as precisely as possible. I had to practice on the balun slot-cutting procedure two times before I was satisfied I had done a good job on the final cut.

Use an eye magnifier to be sure you have cut through the copper eliminating shorts in the narrow slot. Use an X-acto knife to trim and remove bits of copper in the slot, and try as best as you can to keep the inner copper and Teflon in contact. Then, when you are satisfied that the balun slot is the proper length and not shorted by a bit of copper, cut off the Teflon end of the 141 coax cable trimmed to the end of the copper leaf section, leaving the center conductor intact. (See **Fig. 3**.) Now, fold over the center conductor, cutting off the excess and solder it to the center of one copper quarter wave leaf section. Leave the other quarter wavelength section open at the end of the slot. This end of the balun will be soldered to the center of the slot on the brass tube feeding RF to the center of the slot.

This completes the construction of the quarter wavelength balun. Set it aside till construction of the antenna is ready for final assembly.

Preparation of the main slot antenna construction can be done at home, but we decided to send it out to a machine shop to cut the slot length in the 1-1/4-inch tube front side. We had our slot cut into the tube face approximately 0.156 inch wide for a length of 20-3/4 inches. The machine shop cut the slot for each antenna for $15 each. We forgot an important issue here. Do not cut the slot on the far end of the brass tube. Leave a short section of tube effectively shorting the end of the brass tube. It will provide rigidity to your antenna. We had our slots cut through to the end of the tube. This resulted in the slot bowing open starting at the cut spacing of 0.156 inch to something like 0.250 at the far end of the tube.

To bring the slot into the desired dimension of 0.156 inch, I put a set of six automotive hose clamps on the slot element length and adjusted to make the slot conform to specifications. It sprang open again when I removed them. I re-applied the hose clamps, heating the brass section and clamps on a gas range to maximum heating of the brass till it was near as hot as the two burners on the stove could provide (15 minutes).

Slowly reduce the heat over an additional 15-minute low heat cooling procedure. Then turn off the burner and let air-cool for an hour or so. Do not cool with water. Once cool, the brass has been re-annealed and should show few springing properties. Kerry N6IZW developed this part of the procedure for annealing the brass to conform to desired width.

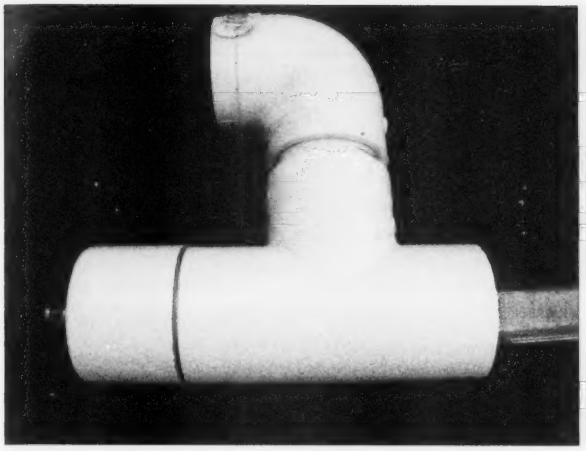

Photo A. *PVC mount using a 90 degree "T", end cap, and an elbow, all 1-1/4 inch PVC SCHD 40 fittings.*

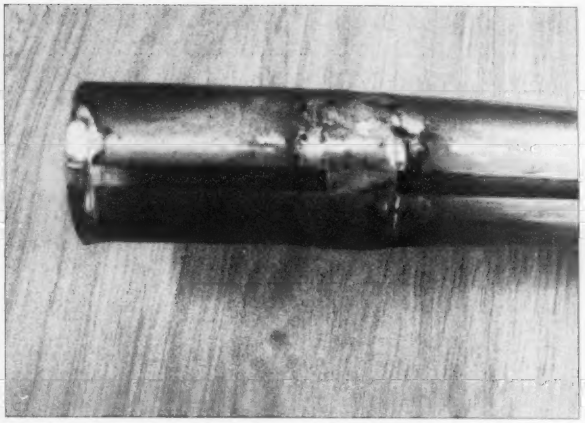

Photo B. *Top of finished slot antenna showing end short and final short after adjusting the slot to resonance at 1296 MHz. Same as* ***Fig. 3****.*

The slot dimension should be close to 0.156 inch. Remove the clamp at the top end of the slot and solder a short across the open end of the slot to hold it at 0.156 inch. Remove the remaining clamps and check the slot dimension. I use a file to smooth out the remaining length of slot to make it uniform. The file width was 0.145 inch and worked well to smooth out the slot width to 0.156 inch.

With the top of the slot shorted or left closed, measure down the length of the slot for a length of 20-3/4 inches. Mark this spot as the starting end slot length. It is longer than we require but gives you some fudge room to adjust without repositioning the center feed balun. Form the length of 141 coax and balun to fit near the center of the slot and then formed back to the rear of the inside of the tube. When all is formed properly with the 141 coax hard-line, tin the exact center left and right side of slot center, and solder the ends of the two leaves of the balun to the slot center sides. Gently do a little jiggling to final-form the end of the 141 coax coming out the bottom of the brass tube. Solder it well to the bottom of the brass tube to form a rigid holding structure to support the coax fixed firmly to the bottom of the tube. Most important is that the balun end be free from stress from the coax connector feed end, and anchored well in the rear of the slot antenna (see **Fig. 3**).

Now comes the fun. If you do not have test equipment, then you might want to use the stock dimensions I used in my construction. If you have a microwave power meter and directional coupler as described last time in my "Above & Beyond" column, then you're ready to check SWR, or rather return loss.

With the directional coupler connect it backwards from normal power measurements. This will allow reflected power to be measured at the sample port. With +10 dBm @ 1296 MHz forward power to the antenna I read a –4 dBm power reflected with no antenna or a short placed on the coupler antenna connection. After replacing the antenna as a load, check the meter reading. Next, solder small strips of copper across the slot to decrease the slot length; then trim to frequency. Symmetrically change the length of the slot above and below the center balun tap point. In my antenna measurement, I found 18 inches to be very near total slot length for best return loss (best SWR) @ 1296 MHz. Probably could have done better, but it was good enough for me. At 8 inches length (above and below of center balun tap point), I measured -19 dBm power with +10 forward power used for the test. Subtracting the -4 with a short gives me a return loss of 15,

Continued on page 56

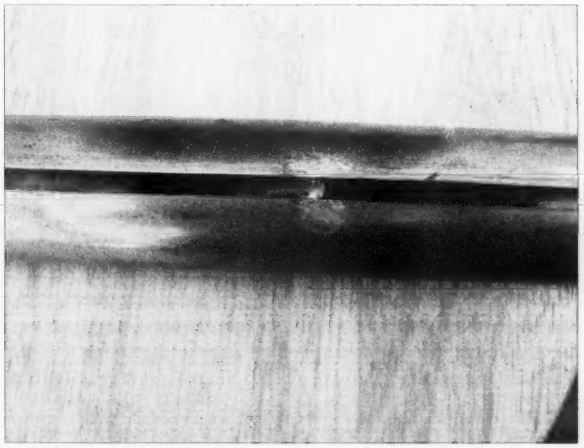

Photo C. *Center feed of slot antenna showing each edge of center feed point soldered to 141 balun side contacts, or "leaves."*

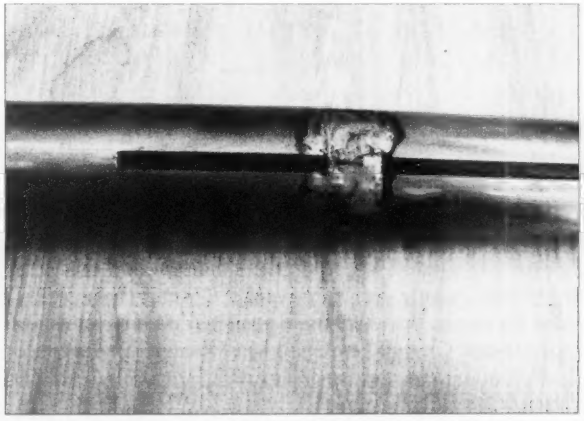

Photo D. *Bottom end of slot antenna showing end of cut slot and soldered final adjusting copper strap forming final adjustment for 1296 MHz.*

HOMING IN

Radio Direction Finding

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From Radio Camp to the World Championships

A summer camp for transmitter hunters? Why not? Most hams have heard about Radio Camp licensing courses put on by the wonderful Handi-Ham organization in Minnesota. Last year I told you about Radio Camp for teens in Texas, where they get licenses, win handie-talkies, and do some UHF transmitter hunting with them. This year brings the first Radio Camp for lovers of international-rules on-foot hidden transmitter hunting, also called foxtailing, radio-orienteering and ARDF.

In August, eleven would-be champion radio-orienteers from seven states went to Europe, where they spent one week of intense training at an ARDF Radio Camp, then the next week at the Eleventh ARDF World Championships (WCs). These enthusiasts were Dick Arnett WB4SUV, category M50, Erlanger, KY; Bob Cooley KF6VSE, M60, Pleasanton, CA; Dave D'Epagnier KØQE, M40, Longmont, CO: Bob Frey WA6EZV, M50, Cincinnati, OH; Marvin Johnston KE6HTS, M50, Santa Barbara, CA; Harley Leach KI7XF, M60, Bozeman, MT; Nadia Mayeva, D35, Mooresville, NC; Gyuri Nagy KF6YKN, M40, Maspeth, NY: Larry Noble NØNDM, M40, Aurora, CO; Charles Scharlau NZØI, M21, Chapel Hill, NC; and Csaba Tiszttarto, M21, New York, NY.

While there, they came closer than ever to hearing our national anthem played during the awards ceremony. I'll have more on the championships later, but first, the camp.

Hard work in Hungary

Regular "Homing In" readers will recognize Gyuri Nagy KF6YKN as the Hungarian ham with U.S. resident status who has been teaching and training stateside hams in the fine points of ARDF since USA first went to the WCs in 1998. Before that, he had won medals in Hungary, where his original call is HA3PA.

With the ARDF WCs taking place in Slovakia this year, the logistics were perfect for Gyuri to set up a week of intensive training just beforehand in his native hometown of Pecs. (It's pronounced "PEDGE" to rhyme with "edge.") Helping him were his wife Susan and his sons Daniel and Thomas.

Rules of the International Amateur Radio Union (IARU) for WCs permit each country to enter a maximum of three persons in each of the five age categories for males and four age categories for females. In categories with more than three applicants for our team, selection was based on performances on the First USA ARDF Championships last summer in Albuquerque and the Second USA ARDF Championships last spring near Atlanta.

ARDF Team USA members are among the best foxtailers in our country. Nevertheless, they are new to the sport, as are most

Photo A. *Around the dinner table after a busy day of training in Hungary are members of Team USA and Team Australia. The empty chair belongs to Karla Leach KC7BLA, who took the photo. Clockwise around the table from there are Bryan Ackerly VK3YNG, Bob Cooley KF6VSE, Marvin Johnston KE6HTS, Dick Arnett WB4SUV, Adam Scammell VK3YDF, Bob Frey WA6EZV, Harley Leach KI7XF and Bruce Paterson VK3TJN. Standing in back are hosts Gyuri, Thomas, Daniel, and Susan Nagy. Csaba Tiszttarto, another team member and native of Hungary, was not present that evening. (Photo by Marvin Johnston KE6HTS)*

Photo B. *ARDF Team USA shows the flag at the WC opening ceremonies. In the front row, left to right: Dave D'Epagnier KØQE, Csaba Tiszttarto, Larry Noble NØNDM, and Marvin Johnston KE6HTS. Back row: Dick Arnett WB4SUV, Bob Frey WA6EZV, Karla Leach KC7BLA, Charles Scharlau NZØI, Nadia Mayeva, Bob Cooley KF6VSE, and Harley Leach KI7XF. Not pictured: Gyuri Nagy KF6YKN. (Photo by KE6HTS)*

Photo C. *Larry Noble NØNDM crosses the 80m finish line and gets ready to register his SPORTident chip. (Photo by KE6HTS)*

Photo D. *Once a DXer, always a DXer. Bob Frey WA6EZV operates special events station OM9FOX. (Photo by KE6HTS)*

stateside hams. So it was good that six members of Team USA and three members of Team Australia were able to take the extra time to attend both Gyuri's training camp and the WCs (**Photo A**).

"Gyuri did a superb job," says Team USA Co-Captain Dick Arnett WB4SUV. "I think I did much better as a result of the training camp. It wasn't just from hunting lots of transmitters, but he also would sit down with us and explain the types of courses — classic, nonclassic and so forth. As soon as Gyuri looks at a competition map, he can usually tell approximately where the transmitters will be, and even which numbers will be where, because of the distances that must be traveled by the various category competitors. We benefited from his years of experience."

Agreeing with Dick was long-time orienteer Bob Cooley KF6VSE, who celebrated his 60th birthday during the WCs. "It's important to make a lot of mistakes while practicing, and work so that you don't make them in the future," he explained. "I got the opportunity to get fooled in a variety of ways."

Marvin Johnston KE6HTS was on his way to his third WCs. "Before the training camp, we went to the Hungarian national championships," he says. "From what I understand, they weren't differentiating between Hungarians and visitors. If one of us had taken first place, he would have been the Hungarian national champion!

"That wasn't likely," Marvin continued, "because the Hungarian team candidates had the advantage. They had been practicing on the same terrain for a week. Saturday was the 2m hunt, Sunday was 80 meters, and both were on the same map. The courses were quite long. Not surprisingly, Gyuri took a second place."

Team USA's other co-captain was Bob Frey WA6EZV, who exclaimed, "I was just tickled to death with that camp! It was fantastic! We had two full courses in a day sometimes, and Gyuri pretty much set them all up himself. We students were so thankful that we got together at the end and bought him a new digital camera."

"Gyuri concealed the transmitters very well," KF6VSE added. "He put the flag about 10 meters away. That was to keep passers-by from seeing the flag and stealing the transmitters."

On to the main event

The week of training passed quickly and soon it was time to head for the WCs. This year's site was Tatranske Matliare in the High Tatras of the Slovak Republic, at about 900 meters elevation. Two Slovak hotels there had been taken over for the exclusive use of competitors.

WA6EZV explained how their caravan got from Hungary to Slovakia. "The Aussies went up with us too. Gyuri drove his vehicle. He also arranged a minivan that I think belonged to Csaba's sister. Csaba drove that. There was another car that took the rest of the people up."

Although the site is called the High Tatras, the elevation was only about 2,000 feet, much less strenuous than the 7,000-foot mountains near Albuquerque last year. "The weather was gorgeous," says WA6EZV. "There was no rain until after the last hunt, so we didn't have to contend with lightning. Since it was usually lightly overcast and cool, you could run without overheating."

Tuesday, September 3 was a day of practice and the opening ceremonies (**Photo B**). "At the practice, the Aussies discovered that they had left their RDF antennas in their packing tubes down in Hungary," says Bob Frey. "Dick and I loaned them our spare tape measure beams. We had doubled up on almost everything, except two-meter receivers, which was to cause us problems later. I had two 80m sets but only one 2m set, which is ironic."

For the first time in the ARDF WCs, SPORTident chips were used for accurate registration of each competitor's total time and the times to each fox (**Photo C**). Time limits for events at the World Championships are typically two hours. This time, they were two and a half hours. Apparently the Slovak organizers knew that their courses were extra difficult.

Bob Frey says, "At our team meeting before the first event, the last thing I told everyone was to be sure to head for the finish early enough to avoid going overtime. But five went over anyway. The courses were the hardest I've ever seen."

"The training camp was very helpful for guessing running times," says WB4SUV, "but this 2m course fooled me. Coming from the fox farthest out I had 37 minutes to make it home. I thought I could get to anywhere on the map in that time, but it was unbelievable what I had to go through.

"There was only one good route," Dick continued. "It was a very small corridor of a trail, and if you missed it as I did, you had a grueling experience because there was only heavy vegetation and swamp. I had to go uphill at about a 45-degree angle, and it was a long uphill. I was sinking almost to my knees every step because there was water

Photo E. *Nadia Mayeva, Team USA's best performer in terms of placement, stands at the 80m finish with Charles Scharlau NZØI (left) and co-captain Dick Arnett WB4SUV (right). (Photo by KE6HTS)*

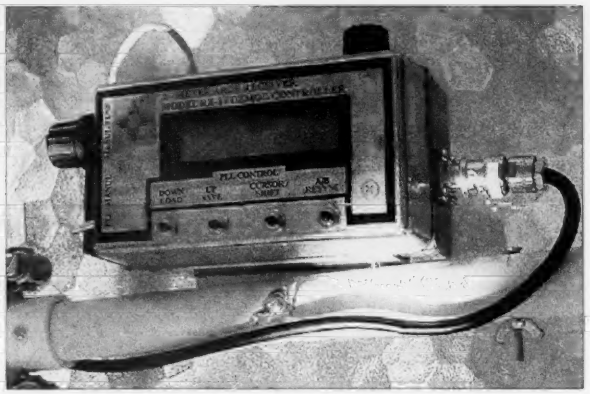

Photo F. *This PIC-based VHF tuner, code-named "OzMod," attaches to the cover of the Ron Graham RX1 ARDF receiver. (Photo from presentation by WB8WFK and K5ATM)*

coming down the hillside. When I got back to the hotel, I threw my shoes away."

For want of a coil ...

WA6EZV crossed the 2m finish line with 45 minutes to spare, but that was because he could only hear and hunt two of his four required foxes. "The local oscillator (LO) coil on my Ron Graham receiver apparently went funky," he says. "It worked fine until we got to camp in Hungary. Gyuri had all his transmitters operating down near 144.0. Because the RX1 doesn't cover the entire 4 MHz of the band, I had to retune the LO down. It worked fine until the last day of the camp, then it quit. Harley Leach KI7XF and I worked and worked on it and we thought we had it fixed, but on the training day I could tell it still wasn't working right.

"Charles had a spare RX1, so we took it to the practice on Tuesday. It was fine, or so I thought, but it turned out that his receiver also wasn't tuning down low enough. The bottom end of his tuner was the homing beacon frequency, and the fox transmitters were lower than the homing beacon. They were so strong that I was copying them OK on the image frequency.

"Using Charles' set on the 2m hunt, I was able to hear a weak image of one of the transmitters, so I tracked that down. There I heard another weak image. I found that, but I couldn't hear anything else, so I went to the finish."

Not surprisingly, Gyuri Nagy KF6YKN led Team USA in the 2m standings. Running in the hotly contested M40 category (males ages 40 through 49), he placed fifth out of 50 competitors with an excellent time of 1:13:22. Only two Russians, one Slovak, and one Estonian did better in that category. Another notable performance was that of 60-year-old Harley Leach KI7XF, who was 17th out of 30 in the new category for men 60 and older. He was featured on the cover of *73 Magazine* for January 2002.

Thursday was a day off for the competitors, with cultural and sightseeing adventures. Some found time to operate special event station OM9FOX (**Photo D**). Rested and recuperated, the competitors were up early on Friday for the 80-meter hunt. Their initial bearings led most of them up a very steep hill right out of the starting corridor.

"You had to see this hill," WA6EZV recalls. "You'd think you were near the top, but then you'd make a bend in the road and — oh, no — more hill. Fox MO5, my first, took me 50 minutes to find even though it was only two miles away. The wet hill in China two years ago was a cakewalk compared to this one. The whole course had to be at least 10 kilometers. A couple of foxes were way out on a mountainside."

Later, KE6HTS discussed routes with two of the medalists in M50 category. Oleg Fursa UT4URL of Ukraine, who won the gold in 1:28:14, indeed ran more than 10 kilometers. Tchermen Gouliev UA3BL of Russia took silver with a time that was less than two minutes over Oleg's, but Tchermen's route was only about 8.5 kilometers.

It was this day that Team USA came within two minutes of bringing home its first medal. Nadia Mayeva, a former European ARDF champion who now lives in North Carolina, took forth place in D35 category (women ages 35 through 50) by finding her four required transmitters in 1:49:02 (**Photo E**). She was edged out by Han Chunrong of China, who won the category bronze medal in 1:47:20.

"Out on the big course, Nadia thought that she was doing so poorly that she almost gave up," WB4SUV reports. "As it turned out, she missed the gold by only a little more than one fox cycle." USA also posted team scores in four categories on 80m. While they weren't medalworthy, they were better in some categories than Austria, Belarus, Bosnia-Herzegovina, Croatia, Estonia, France, Japan, Korea, Netherlands, Norway, Romania, Slovakia, Sweden, and Yugoslavia.

Karla Leach KC7BLA represented USA and IARU Region 2 on the International Jury overseeing the competitions. Her assignment was Course Marshal at one of the foxes. "She was out in the woods for several hours," says WA6EZV, "and they didn't give her a chair or anything. She borrowed an air pillow from me just to have something to sit on."

There's a lot more to tell about USA's trip to the 2002 WCs, including stories about breaking into a castle, the defective transmitter, sinkholes, and a bee sting. All that will have to wait until next month. Meanwhile, you can find out which countries won medals and view all the Team USA members' course times at the "Homing In" Web site.

Many thanks to the ARRL Foundation and the Colvin Award Fund for providing entry fees of Team USA, which included food and lodging during the competition. Team members paid for their own training expenses and airfares.

An important correction

September's "Homing In" covered the 2002 Dayton Hamvention Foxhunt Forum, featuring presentations by several hams on technical and tactical RDF topics. One was Gerald Schmitt KK5YY of Los Alamos, New Mexico, who described a low-cost PIC-based phase locked loop (PLL) tuner for the Ron Graham RX1 two-meter ARDF

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On the Go

Mobile, Portable and Emergency Operation

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The Physical QSY

Some people never move far from home, while others find that moving is a repeating event. If you face a move, you may want to add a few things to your "To Do" list that affect your ham radio operations.

As you read this, I'm in the process of moving to Cheyenne, Wyoming. Cheyenne is a beautiful place in the high plains about 1,000 feet uphill from Denver. I hadn't worn a cowboy hat since Rin-Tin-Tin was a popular black-and-white television show. However, that got remedied in July as I helped provide communications for Cheyenne Frontier Days — both hat and boots are required parts of the official uniform. As you might guess, I'm quite pleased to be here, but I still find moving to be an onerous task. However, being the cock-eyed optimist that I am, I try to find the silver lining that surrounds the dark clouds.

Naturally, the usual and customary issues that surround moving are pretty self evident. I need to find a house that the XYL finds acceptable. Need to arrange for utilities and insurance on the house. There's daycare for the kids, tags for the cars, etc. When it comes to ham radio, there are some readily apparent issues to be resolved. Need to file a change of address with the FCC on my license and program the local repeaters into my radios. But with every challenge there is an opportunity, so what are the opportunities that present themselves with a move?

Here are a few to consider. If you read the columns recently about setting up an emergency HF operations, you may find these categories to be a bit familiar. This is probably because a permanent move and setting up a temporary station are pretty similar.

1. Ham shack — Most shacks tend to evolve with equipment being added after the latest hamfest and parked in whatever location seems available at the time. Moving presents an excellent opportunity to redesign the ham shack in a logical and operator friendly way. Which desk/table/hutch do I want to use for my main operating position? Do I want to have my main computer in the ham shack, or is that more of a family computer, now? If so, do I want to network the ham shack computer to the other computers? Is this a good time to go wireless networking? In my case, I'm anticipating separating my APRS system from my PACTOR and HF system. I'm thinking seriously of putting APRS on both VHF and HF with a possible Internet gateway. If so, this will not require the same type of desk based layout as my main HF system since it will be primarily an automatic system. It will be located so that the feeds from my weather station are readily available, but won't require a comfortable place to sit for long periods since I don't expect to be spending a lot of operating time sitting at these radios. For APRS it's more a check of the data and move on. On the other hand, by moving APRS out of the way, I can make my main HF station much more comfortable with more room to spread out. Of course this also has me thinking about what gadgets or gizmos would fill up the space I cleared. One last issue to consider is determining the perfect location for the ham shack. I like to be at or near ground level so I can get a proper ground into the shack. I also like to be slightly separated from the family so the noise from the shack doesn't bother them, yet close enough that they don't feel that I'm trying to avoid them. Finally, the new location must fit in with the overall geographic plan as determined by the XYL.

2. Antenna system — With the altitude of Cheyenne, I figure a little antenna altitude should go a long way. I have a little over an acre and there are some pine trees on the property, so there are some possibilities. At this point I'm considering a vertical and a dipole for general HF operations as a starter. Later, I'm hoping to add a tower with a Yagi for at least 10–20 meters with a 2-meter/440 MHz vertically polarized beam over that. On top of everything I'd add a vertical 2-meter antenna for APRS. Of course there would be a few additional miscellaneous antennas that would sprout on occasion, but the main farm would be pretty complete with these.

3. Power system — As long as I'm redoing everything, I might as well check out my power system. The preliminary approach I'm going to take is to power the APRS and VHF systems from gel cells that are connected to the A & A Smart Charger. That should keep me running for quite some time in the event of a power loss. While I do have a deep cycle trolling battery for the HF rig, I haven't yet decided on how to recharge that. Cheyenne does have two natural forces that are plentiful — sunshine and wind — and it should be possible to tap into one of those, but I haven't decided which direction to take. I am leaning toward solar power strictly because there are no moving parts, but given the winds we have, a wind turbine might be more effective. When I do decide, I am planning on mounting the deep cycle battery outside in a weatherproof case so that any hydrogen vapors will be dissipated without creating a fire hazard.

4. Evaluation of potential hazards — Each area has its own potential hazards to face. Along the coast there is the danger of hurricanes. In California, earthquakes present a threat. Here the most common events appear to be weather-related, with high winds and severe storms with tornadoes being among the most severe. To me this presents several issues. The first is that SkyWarn will be a key player and I will need to get oriented to the procedures used in this area. Second, I need to evaluate my station in terms of high wind issues. If I do erect a tower, I need to make sure that it is rated high enough to deal with the expected wind velocity. My dipole will need to be installed so that it has enough give in the wind so as to prevent the wire from being stretched and

Continued on page 56

New Products

Gordon West Extra Class Prep Materials

Gordon West WB6NOA has released his new Extra Class Element 4 license prep book and audio cassettes.

"The all-new Extra Class test is actually easier to prepare for because some of the complicated old questions were eliminated, and all new questions are actually reworked Advanced Class and old Extra Class questions," says West, who has identified the most new questions on the Extra test as the simple new rules and regulation topics.

The book and tapes cover all 801 questions and answers, and an upbeat description of the correct answer. West also reveals some of his classroom secrets on how to spot many of the technical correct answers BEFORE you begin to work out the problems on your calculator. All calculator keystrokes are clearly explained for those hams who may be a little rusty on trig!

All Gordon West training materials are published by Master Publishing, Inc., and all of this materials are available at ham radio dealers throughout the country and via mail order from the W5YI Group by calling 800-669-9594. Gordon West Technician and General Class books for beginners are available at Radio Shack stores everywhere in the USA.

West regularly travels widely, attending hamfests and offering training classes, and his on-the-air activities exemplify his active participation in the Amateur Radio Service.

2002 Christmas Key

In what is becoming a ham radio Christmas tradition, Morse Express has released its 2002 Christmas Key, a gold-plated miniature brass key that will double nicely as a Christmas tree ornament.

The Morse Express key is a fully operational miniature key, hand-machined from solid brass and plated in gold. It measures a tiny 2-3/8 by 1-1/8 inches at the base and weighs a surprising five ounces.

The 2002 key incorporates several improvements over the 2001 key, including miniature binding posts for cable connection, chased wiring on the bottom, and an ebony knob. The base is a little longer to accommodate the binding posts, and a little thicker for added stability. All of the usual adjustments (trunnion bearing tension, lever spring tension, and contact spacing) are available by means of gold-plated screws with matching locknuts, and the indented knob is very easy to use.

The machining and assembly processes were done by hand. The base of each key is engraved with Morse Express's "Speedy Key" logo and "Christmas 2002." This is a limited edition of 250 keys, and each bears an engraved serial number on the base.

The 2002 Christmas Key is $59.95 plus s/h, and is available only from Morse Express. Photos and more information are available on the Morse Express Web site at [www.MorseX.com], where you will also find secure ordering facilities.

For further information, call 303-752-3382 or E-mail [n1fn@MorseX.com].

Breakthrough Product Designed for Monitoring Professionals

AOR USA has created the AR-ONE, a new wide-range communications receiver capable of monitoring any frequency from 10 kHz to 3.3 GHz with excellent sensitivity, while providing maximum user flexibility.

"The AR-ONE Communications Receiver was designed and built with computer operations in mind," said Takashi "Taka" Nakayama KW6I, vice president of AOR's North American operations. The AR-ONE has two RS-232C ports on its rear panel. "This will allow the joining of multiple AR-ONE units. As many as 99 AR-ONE receivers can be controlled by a single computer."

The AR-ONE was conceived as a "breakthrough" design. Its many features include ten VFOs; 1,000 memory channels; an ultra-stable frequency reference oscillator; selectable tuning steps and resolution down to one Hertz; the ability to monitor AM, NFM, WFM, USB, LSB, CW, and data modes; a triple-conversion superheterodyne front end; adjustable BFO; high intercept, multi-IF signal output ports at 10.7 MHz or 455 kHz; and more.

Operating features include the ability to control all functions by computer and most functions through the control head. The unit can communicate many settings and readings to the user including such items as signal bandwidth and the strength of a received signal.

The rear panel has two RS-232C ports, an "N" connector antenna terminal, two BNC inputs, power input, speaker output, and the IF taps.

"The AR-ONE is designed for professional users, such as governments, military applications, law enforcement, laboratories, and others who require the ultimate in a sensitive, wide-range receiver," said Mr. Nakayama." At this time, we do not have plans to produce a version of the AR-ONE that has cellular frequencies blocked, so it cannot be offered for sale to the general public in the USA," he said.

With the ability to link up to 99 receivers, the AR-ONE may be an unparalleled resource for surveillance operations and high end monitoring. The unit can be installed in base or mobile operations.

The user has the flexibility to tune in increments of a single Hz, making most of the widely-used available RF spectrum tunable to the AR-ONE. Its ability to read out signal strength in user-selectable dBμV or dBm units makes direction finding more scientific, and its ultra stable frequency reference brings a lab-quality readout to the user in day-to-day operations.

Rear-panel IF outputs allow for secondary signal processing and analysis. One example of a use for this feature is, AOR has developed a working prototype of an APCO 25 digital signal decoder that should be available in the near future. In addition, other accessories or computer programs make visual signal display possible, including graphic displays for vector analysis.

"The AR-ONE may well redefine what is possible in terms of monitoring," said KW6I. "We believe governments need enhanced tools for surveillance to keep pace with communications developments. One area of interest is the ongoing battle against terrorism across the world. We hope the AR-ONE can play a role in bringing those efforts to a quicker conclusion."

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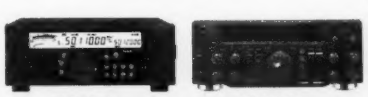
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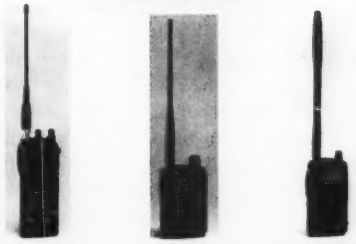
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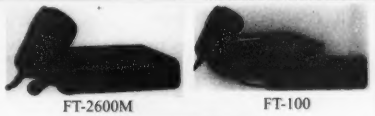
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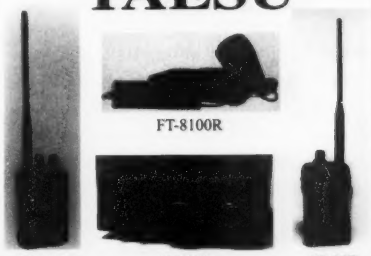
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New and Improved Early PSK31 Program

You may not realize it, but we are terribly spoiled with all the new and great software made available for our hamming pleasure. If you want to take a trip into the not too distant past, you will be amazed just how far things have come. In addition, you will find an old program that will perform just about as well as the new stuff with a Big Plus. It will work under Windows 3.1, 95/98 and NT, and, get this, with a computer as slow as a 486/33. You just need one with a soundcard.

I broke out the latest version of the G3PLX PSK31 software the other day and got it up and running, which was not really difficult. The tedious parts are tuning and totally manual operation.

Even with the skimpy little tuning window on this program, you can develop a technique for ease of tuning. The remaining problem is need for type-ahead and flexible macros. There is a well developed enhancement by WD5GNR, aptly named the PSK Front-end. You get these two programs together, do a little organizing, and you will be surprised how well this combination works.

Before I go too far, I must admit to getting in a bit of a hurry as I was setting this up and didn't have all my ducks in a row. As most of us do, I was excusing my less than crisp operating procedure to a ham at the other end. Specifically, I had not gotten the macros organized the way I prefer.

The contact had never seen this "antique" software and one of his parting comments was, "I bet that makes you feel like you are working with spark-gap." Tongue-in-cheek comment of course, but it helped put a few ideas in perspective for me. Chiefly, 4 or 5 years is like an eternity in the evolution of digital modes; so much has happened so quickly.

You may want to look into these programs for more than just nostalgia purposes. They will run under Windows (I ran them in Win95) with a lightweight CPU and minimum RAM. Also, if you take a look, you will find versions for the PSK31 software written for other platforms such as DOS, Linux and even a version to be used without the soundcard by use of the EVM module.

How to get it going

You can download everything you see in use here as freeware. For the PSK31 software, go to *The Chart* on the Web [http://kb7no.home.att.net] and click [http://aintel.bi.ehu.es/psk31.html]. You will likely be drawn in by some of the great info that you never knew existed about PSK31. Click on the Available Software link and you will see what I mean about so many varieties available.

To get the other software to really make this project fly, again on *The Chart,* click on: [www.al-williams.com/wd5gnr/pskgnr.htm]. Once there, you are in for another information harvest. You will need the Help File, but that comes with the PSKGNR download and installation. The Help file is in HTML, so it will open in your browser when you need it. I found it was a great help as I was organizing the macros. Also, you may want to download the PTT program. Nice to have that automated.

Installation goes pretty much by the book. The PSK31 software installs in the root directory and the PSKGNR magically finds its way to the Program Files as it installs. If you install the PTT package, it goes with the PSKGNR file.

As I look back at this, I may have missed something. The Setup menu in PSK31 needs your callsign and then asks you to designate a PTT serial port. It appears the latest version 1.08 has its own PTT control written in. I have everything installed and it works, but to keep some of the confusion down to a mild roar, at the time of this writing, I brought up the PSK31 program all by itself and sure enough, the PTT controls from that software just as well as from the PSKGNR front-end. They do not fight each other as the transmit control from either program keys the rig. I will leave it alone. See what works for you.

Anyway, the setup in the PSK31 program is very elementary because the operation of the software is very bare-bones. Works well, just lacks for the niceties of convenience.

Enter the need for the PSKGNR front-end. This program is a marvel in its own right. You will find once you have configured this program to your liking that about the only thing you will miss may be rig control. It even does some semi-automatic logging that really is a help.

Many features made to order and some DIY

The first thing to impress many of us is how one program can search around a computer with so many files and directories, home in on another program and execute it without any hints from the operator. At least, as best I recall now, after the installation of the programs, when the PSKGNR was booted, it automatically found the PSK31 program and booted it at the same time. There is a place under Tools/Options to insert the path and it is there now, so if it could not be found by "sniffing" for some reason, the path could be written in.

So much for magic. Under that Tools/Option pull-down you will find many decisions to make. Fortunately, the Help File will do its job for you and get you through the rough spots.

If you go to Tools/ Options/ Options, you will find a lot of choices. Two that are a big help is to check "Macro Palette on start" and, if you have a CD callsign database, check "CD Lookup Window on start." If you can display these windows, you will be surprised what great crutches they can be to tell what is going on.

One of the reasons for the palette window for the macros is there are no little boxes for the other station's callsign and name. You enter these manually when a

window appears after hitting F12. No, there is no double-click to capture those bits of info.

However, once the other station's callsign is entered, your macros work (we will get to that) and you can hit the Lookup Now button in the callsign window and the CD will feed the information to the other little window. Really is magic and it gets better with some work.

One more item before we hit the macro department. The program does not really interface directly with a log program but provision is made to send the current QSO info in ADIF format to a file of your choice for reading or import into a log program at a later time. If you are like me and keep a running log, this answers at least fifty percent of the need. Beats paper and pen.

What's more, when I went to send the QSO shown in the screenshot to the log file, I paid closer attention than I had on the first experiment and found I could, at that point, enter all the information I ever wish to enter by taking advantage of the pop-up screen that asks details such as frequency, time started and time finished, etc. In all, I entered 12 fields, then when I viewed the info, I found there were only about two of them in need of alteration before I would have imported them into the log program of the hour. I did the entry manually, but if this were to be a permanent mode of operation, it wouldn't take much to make the entry nearly automated.

Macros — the indispensable tools

The macros are not all written out for you as with some other software packages. Some macros come ready to run and seem to be written in stone. I have about a half dozen that make me feel naked when they are not available.

I wrote these and left the originals intact and confused myself with the disorganization. How this comes about is simple. The PSK31 software has 10 macros addressed directly by function keys and you can't mess with these. The PSKGNR program has Shift+F and Control+F keys available and you can alter almost all of these. The one I could not find a way to alter or copy is the Compose screen Clear command, which is CTRL+F9.

After a bit of reorganizing and study I decided the best solution was to put my favorites in the Shift+F category. That made for the least upset in my usual operating routine. For a time I had popular macros spread every which way and could not find them when needed.

If you have successfully written macros in plain language format, this is not much of a stretch. The Help File will give you the information you need and lists the commands that are available. Allow yourself an hour or so to master this, and then operating is a real pleasure.

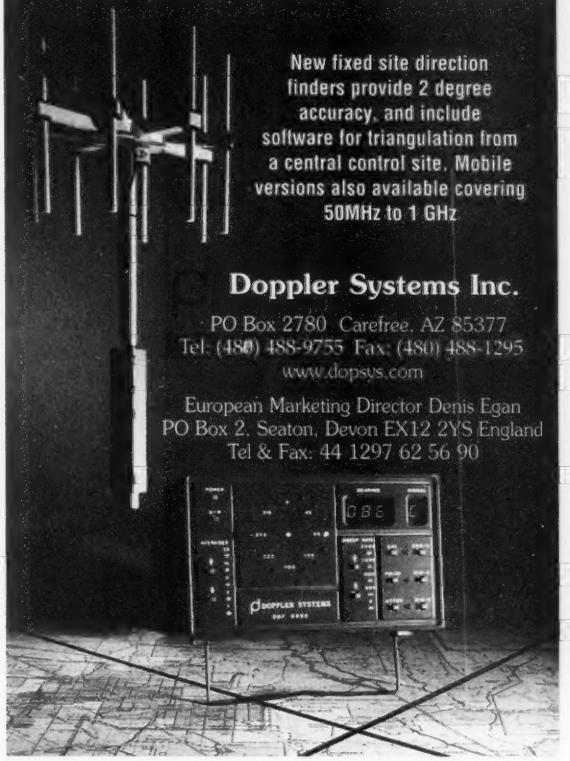
Now, about that tuning problem. The waterfall is small. That is the only way you can describe it. The width is approximately 500 Hz as I measured it. Nothing like the 2 to 4 kHz we are spoiled with these days.

You will find you can help your cause a lot by listening for the pitch of the stronger signals. It won't take long to realize by their pitch whether they are above or below the frequency covered by the waterfall.

Then, as you cross a PSK31 signal, you will notice the tuning indicator above the waterfall changes color and becomes yellow. When the color is right you are close. If you are close enough the AFC will home in on the signal, but it is a bit slow, so it is best to tweak the tuning to get as close as possible.

I found something while tuning that I don't think I ever realized when using this program in the beginning. You can click a signal

TRANSMITTER LOCATION



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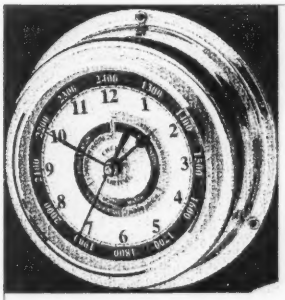

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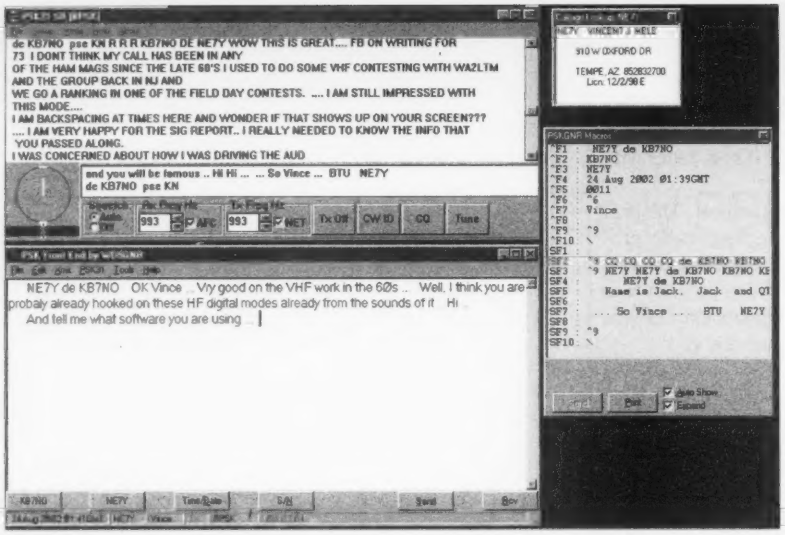
de KB7NO pse KN R R R KB7NO DE NE7Y WOW THIS IS GREAT.... FB ON WRITING FOR
73 I DONT THINK MY CALL HAS BEEN IN ANY
OF THE HAM MAGS SINCE THE LATE 60'S I USED TO DO SOME VHF CONTESTING WITH WA2LTM
AND THE GROUP BACK IN NJ AND
WE GO A RANKING IN ONE OF THE FIELD DAY CONTESTS. .... I AM STILL IMPRESSED WITH
THIS MODE....
I AM BACKSPACING AT TIMES HERE AND WONDER IF THAT SHOWS UP ON YOUR SCREEN???
.... I AM VERY HAPPY FOR THE SIG REPORT.. I REALLY NEEDED TO KNOW THE INFO THAT
YOU PASSED ALONG.
I WAS CONCERNED ABOUT HOW I WAS DRIVING THE AUD
and you will be famous .. Hi Hi ... ... So Vince ... BTU NE7Y
de KB7NO pse KN
993
993
Tx Off
CW ID
CQ
Tune
NE7Y de KB7NO OK Vince ...Vry good on the VHF work in the 60s .. Well, I think you are probaly already hooked on these HF digital modes already from the sounds of it Hi
And tell me what software are you using
NE7Y VINCENT J MELE
910 W OXFORD DR
TEMPE, AZ 852832700
Lon: 122/98 E
PSKGNR Macros
^F1 : NE7Y de KB7NO
^F2 : KB7NO
^F3 : NE7Y
^F4 : 24 Aug 2002 01:39GMT
^F5 : 0011
^F6 : ^6
^F7 : Vince
^F8 :
^F9 : ^9
^F10 : \
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SF2 : ^5 CQ CQ CQ CQ de KB7NO KB7NO
SF3 : ^9 NE7Y NE7Y de KB7NO KB7NO KB
SF4 : NE7Y de KB7NO
SF5 : Base is Jack, Jack and QT
SF6 :
SF7 : ... So Vince ... BTU NE7Y
SF8 :
SF9 : ^9
SF10 : \
Save
Print
Date Show
Expand

Fig. 1. Keeps on Tickin'. These two seemingly ancient programs working hand-in-hand will surprise you. Real performance with PSK31 on Win 3.1, 95/98, and NT, even with a 486/33! The upper left pane is the original PSK31sbw as we used in the beginning. This is an update to vers. 1.08, but remains the austere, no-frills descendent of what gave the original thrill to so many at the beginning of the digital revolution. Life became much easier when along came the PSKGNR front end allowing customizable macros, type-ahead, and so many features we take for granted nowadays. The upper right is the window displaying the info from the QRZ disk. Works with all the popular databases. Below that is the macro palette which displays as an on-screen "cheat sheet." I wrote and placed all my favorite macros in the Shift+F section to reduce brain fatigue. Some macros are written in stone with the regular function keys and a few of these were duplicated. You can use at least 30 macros as you desire. The tuning is accomplished with the tuning display in the lower left of the PSK31sbw program panel. Though the waterfall is only 500 Hz wide and very shallow, you can carefully place your cursor on a signal trace, click it, and it will center for you. When you are properly tuned the indicator in the round tuning window will change color and go vertical as shown. On idle, an IMD reading is given in this round area. There is no "box" to display the other station's callsign or operator name, and this is a good reason to display the macro palette (optional). Entry of the callsign is manual into a pane after hitting the F12 key. From there you can do call lookup either from disk or the Internet. Plus, when finished you can log to an external file in ADIF format. And, if you are really adventurous, there is provision for contest exchanges with increments. Everything but rig control. Have fun.

trace in the waterfall and the spot you click will suddenly be brought to the center under the tuning indicator. It takes a little more care than what we have become used to these days but it works.

Fig. 2. Find the Chart.

A little hint: Check and adjust the "Tx Freq Hz" audio frequency (NET) to match the "Rx Freq Hz" (AFC). These, even with the NET box checked at this station, did not track (by a bunch). If they do not read the same, the other station will never know you are transmitting to him.

I found this software, when treated with some tender respect and given a proper application of setup and macros is a great performer. There is no problem with reception and the audio drive works out just fine as it was set for other software. The signal reports were great and it is a blast to use. Give it a try sometime. If you weren't around in "the beginning," you will see for yourself what the pioneers endured as they journeyed through that early digital wasteland.

Minor irritant resolved

Many of you recall the ongoing operating system war within this shack. I have espoused the merits of using Win98se for general ham use and it is, overall, the most successful of the various Windows operating systems. Some hams report excellent results with Windows XP, and there are even a few who are using the dastardly Windows Me which gave me fits and definitely does not work with quite a bit of the popular hamware.

The local problems started to reappear in a slightly different form as I added more software packages to this machine. There are at least 45 different utilities, ham programs, and the necessary word processors, graphics programs, and other such necessities installed, and I have been warned that too many programs is a definite no-no.

The major problem now? The blue screen error-syndrome. A lot of it can be traced to background ready-to-run software that apparently is continually pawing at the gate trying to get out while I am doing something else.

I discovered a fairly simple solution while tracking down another utility a short time ago. I downloaded a registry repair program named "Registry First Aid." It is a relatively small easy to use utility that quickly and efficiently removes the many unwanted registry lines that confuse the system. It is shareware with a price tag of $21 for registration. If I use it often enough, the blue screens are a thing of the past. The link to download this shareware is now on the Web in *The Chart*.

"Often enough" translates to several times a week. It only requires a few minutes each time around and really relieves the tension. I was told by someone in-the-know that Norton has a package that includes a registry repair module that bears looking into. I am sure there are other similar programs, but when you find one that suits your needs such as this one you will be one happy computer user.

Web site with *Chart* easier to find

At this writing, the KB7NO Web site [http://kb7no.home.att.net] that contains *The Infamous Chart* which used to accompany this column has been up and running for about two months. Finally, all the ducks got in a row and it can be found with a search on Yahoo by simply entering KB7NO as the search.

This may sound unnecessary when the

Continued on page 57

QRP

Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
955 Manchester Ave. SW
North Lawrence OH 44666
[prosolar@sssnet.com]

Dayton Highlights

Dayton Hamvention 2002 has come and gone. For the most part, the event went just fine. Except for the weather! This time, on Friday afternoon, we got buckets of spring rain. But it was a very cold spring rain. Everyone was huddled under sheets of plastic trying to keep warm. In fact, it was the coldest spring on record in the state of Ohio! Had the temperature dropped a few more degrees, we'd have had snow! But even with the rain and low temperatures, everyone seemed to have a good time; even the vendors in the rain-soaked flea market.

Once again, Ten-Tec was the attention leader at this year's Hamvention. The new Orion HF transceiver generated a line of hams waiting to ask questions and to play with the radio. But for us with fewer bucks to spend (the Orion comes in at $3,300), the new Argonaut V produced just as much attention as the Orion.

The Argonaut V is the latest in a long line of QRP transceivers produced by Ten-Tec. Starting with the Argonaut 505, then the Argonaut 509, perhaps the most popular QRP transceiver ever made. The 509 remained the company's namesake until the Argonaut 515 came along. The 515 was a stripped down version of the popular Triton series 100 watt HF transceivers. There were rumors of a "super QRP" rig coming from Ten-Tec when the 515 was discontinued. The radio turned out to be the Argonaut II. But a lackluster review in *QST* put the screws to the Argonaut along with the high power version, the Delta II. Let's hope the Argonaut V does not follow in the footsteps of the Argonaut II!

The Argonaut V — a closer look

When the crowds thinned out enough late Saturday afternoon, I managed to get my hands on the prototype of the Argonaut V. It's lightweight, coming in at five pounds. The dimensions are 2.75 by 8.5 by 9.7 inches. making it suitable for a backpacking QRP operation from your local park.

The Argonaut V is constructed entirely from surface mount components. For those of us who are accustomed to seeing boards stuffed with through-hole parts, the Argonaut V seems quite empty inside. With a little bit of pushing and shoving, you could get the entire radio inside a much smaller package.

The Argonaut V shares the front panel and most of the sheet metal work of Ten Tec's 6N2 transceiver. The difference is in the silk screening of the front panel. Of course, the rear apron is different as well, since this is where the PA is mounted.

I guess you could call the Argonaut V a multipurpose radio. It will operate SSB, AM, FM, and of course CW, using Ten-Tec's famous break-in keying. This may be the first QRP transceiver that can operate AM transmit right out of the box. Those boys on 7290 will be in for a treat!

The Argonaut V will also operate all the latest digital modes including PSK31. In fact, the Argonaut V is available with optional TXCO for industrial strength stability.

Why, there's even an optional fan for the rig, too. A fan for a QRP rig? Yea, I asked the same question and was told that some of the digital modes such as RTTY and SSTV are used at QRP levels, too. Under constant key-down conditions such as these, a small fan helps keep the PA transistors cool.

Like the Jupiter, the Argonaut V is a software-defined radio. You can easily add new features to the radio by downloading the latest firmware from Ten-Tec.

Did I mention that there's a choice of 34 software-defined DSP-controlled filters? In addition to the DSP filters, there's memory scanning and band scanning. And, oh yeah, let's not forget about the general coverage receiver, too.

You can have this and a lot more for $749. Add the TXCO for an additional $54 at the time of purchase.

I suspect that the Argonaut V will be a winner with the QRP gang!

QRP RF amplifiers?

There were two at Dayton this year. The first one was the long awaited amplifier for the K2 by Elecraft.

The amplifier mounts to the inside top cover of the radio. The top of the case then holds the heat sink. Designed to produce up to 100 watts of RF, the new amplifier will help Elecraft attract new customers.

Robert Freiss N6CM introduced a small amplifier to match the K1 transceiver. Here are some specifications:

- Operation on five bands, 40,30, 20, 17, and 15 meters.
- Only two low pass filters are needed for the five bands.
- Provision for automatic band switching is included.
- Power output of 50 or 100 watts, depending on version.

Continued on page 58

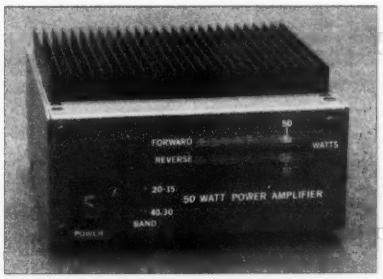

Photo A. *The 50 watt amplifier shown operates CW only on the 40-, 30-, 20-, 17- and 15-meter bands. It is pretty easy to build for the builder of moderate experience.*

Your Turn for a Coil Winder

continued from page 15

Notes

1. See *Building a Universal Coil Winding Machine*, by David J. Gingery, ISBN 1-878087-10-X, published by David J. Gingery Publishing and available from Lindsay's Technical Books, P.O. Box 538, Bradley IL 60915-0538, telephone 815-935-5353, Web site [http://www.lindsay.com]. $8.95 plus postage. (Amazon.com carries many of Gingery's works, but not this particular booklet.)

2. Machine parts and supplies are available from several industrial supply houses. One that I've dealt with and that will sell small quantities to individual purchasers is MSC Industrial Supply Co. Orders may be placed via their Internet ordering site: [http://www.mscdirect.com]. Table 1 shows parts available from MSC. 73

Automotive Battery Voltage Monitor

continued from page 21

power supply voltage from 10V to 16V to test the circuit. The LEDs will light over the voltage ranges determined by the voltage dividers described earlier. If transition voltages different from those designed are observed, check for proper installation of R2, R3, R4, R5, and D1. Now there is an easy way to monitor voltages, with this automotive battery voltage monitor. 73

No Place Like Ohm

continued from page 29

drops from 9 volts to 8.8 volts when a 2.2k load is applied, the voltage dropped across the equivalent internal resistance is 0.2 volts and the current causing the drop is 8.8V/2.2k or 4 x 10^{-3} A. The internal resistance is calculated to be 0.2V/4 x 10^{-3} = 50 ohms.

A complex circuit may seem to be intimidating, but it can be simplified by calculating the equivalent resistance of all the parallel branches and then solving for the equivalent series circuit.

In **Fig. 3,** the equivalent resistance is found by calculating the equivalent resistance of R2 and R3 in parallel, call it R2'. The parallel equivalent of R5 and R6 is found, call it R6'. R4 and R6' are added, call it R7'. Then the equivalent of R2' in parallel with R7' is calculated and added to R1 to produce the equivalent resistance of the network.

Ohm's law is basic to electricity, and it's a law that hasn't been broken; it hasn't even been bent. It isn't always obvious where to apply Ohm's law in a complex circuit, but start by finding the equivalent resistance of all the parallel branches, and then adding the series elements together, and it will untangle. You can always just measure the voltage, but when you have to know the power that will be dissipated or what's going to happen when you apply a load, it's necessary to know the internal resistance. Ohm's law to the rescue. 73

Solid State Junk Box Thermometers

continued from page 32

The zener D8 being 6.2 volts, we need a total resistance of R6, R7, and R8 of 5.166k ohms to provide the wanted 1.2 mA. That implies that trimpot R6 be adjusted to 3.395k ohms,

Reconnect the connection between M1 and R7. With the constant current set at about 8 to 9 mA,. D8 will be operating near its listed test current.

As in the prior unit, the sensor is mounted to a three-way post to allow for remote operation when so desired. Do not forget the black shrink tubing on the sensor section if any testing of liquids is anticipated. The power source may be from plus 12 volts to plus 24 volts with no ill effects. It is brought into the enclosure with a miniature 1/8-inch jack so as to match one of the plugs on a 300 mA, plus 12 volt wall-wart power supply.

In both units, the components were mounted on an epoxy board with 100 thousandths centers, and the board mounted on the meter posts.

Now, you can show your dearest that you really did have a use for your "good stuff." 73

Going Over a Gonset G-77

continued from page 36

Conclusion

This was my first exposure to a G-77 Gonset transmitter. After working with it, I'm impressed with the quality of the mechanical and electronic design. Considerations were taken to make the transmitter user friendly and to make it suitable for mobile operation where vibration and temperature create a hostile environment. Yet, the VFO and tuning stability satisfy the application.

Perhaps one feature that is outstanding for a 1957 piece of equipment is the ease of tuning the VFO to a nearly exact frequency and I suspect that the transmitter's frequency was easily adjusted with the vehicle in motion. With the fairly broad PA tuning adjustments, "critical" tuning was probably not an issue.

If you happen to have access to a G-77 transmitter and are interested in either AM or CW, I suspect that you'll enjoy working with the Gonset. For CW operation, a key click filter will be required. 73! 73

Read All About It!

continued from page 38

The Old Man was rummaging in a junk box, I reached for the tuning knob to get the feel of this paragon of receivers, and he put me in my place with a curt, "Please don't monkey with the receiver."

Well, The Old Man had said he wanted to talk, and talk he did — for nearly two hours. He regaled us with stories of how the Radio Inspector had threatened to confiscate his spark transmitter one Friday back in '24 because he was interfering with Great Lakes shipping traffic, and by the next Monday he had his first vacuum tube rig on the air. He told of being an engineer at a local radio station in the '30s and climbing a 200-foot tower in the wintry darkness to make an antenna repair in time for Amos and Andy. We heard how he was in the South Pacific during World War II, training island natives who didn't know a word of

English to copy code by rote memory: dot-dash, write an A; dash-dot-dot-dot, write B; and so on. His eyes sparkled as the names of hams and radio men he had known rolled off his tongue by the dozen, and he seemed to expect that we should know these people as well as we knew our classmates in school.

Finally, he wound down and said, "Well, this is boring to you. Now, how would you boys like some radio parts, on the square?"

Al managed to say, "Sure!" but I could only hope that The Old Man read the wide grin that broke out on my face as a "Yes!" That first visit he gave me a power supply for my VFO. (I had just gotten my General.) It used a type 80 rectifier, so it must have been from the early '30s or late '20s. I had ridden my bike over, and it was a real struggle to keep that bulky thing under my left arm while managing the bike with my right.

By the second visit Al was driving, and we made sure the trunk was cleared out before we came. Good thing, too, because that time he gave me an old Hallicrafters AM transmitter; it must have been three feet wide and weighed over a hundred pounds. On other visits we came away with antenna tuners, microphones, transmitting tubes, and 500-watt power transformers.

He mentioned that the transformer secondary was 900 volts rms, and when I asked him what "rms" meant, The Old Man practically exploded: "How can you do anything in radio if you don't know what rms means?" So he sat me right down and explained it to me, and even though I was still a little shaky on the details, I told him that I understood it perfectly, Yes, sir!

Well, that's about all. We were supposed to see The Old Man again one Saturday in late May, but Al got a call on Friday that they'd taken him to the hospital, and a few days later we heard that he'd died. What with school and me starting my first job about then, I never did find out what happened to his garage full of stuff and that untouchable 75A-2.

Say, look — I've got to be getting home. The kid across the street is into computers, and I told him that if he'd come over after supper I'd give him my old PC, and a modem and some other junk. It's funny — that kid comes over and gets me talking, and he doesn't leave for maybe two, three hours. I was telling him about my first computer, an Apple II — and I don't think he'd ever heard the name of Steve Wozniak before. And he didn't know what TTL levels were! Now, how's he going to do anything in computers if he doesn't know what TTL levels are? 73

The History of Ham Radio

continued from page 39

stations is reduced and until it shall be in the interest of public service to add new stations.

2. That public interest as represented by service to the listener as opposed to private desire be the basis for the broadcasting privilege.

3. That further division of time among stations is not in the interest of public service and that the Department

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decline to grant any more licenses until the present number of stations is substantially reduced.

4. That duplication of frequencies not be permitted in the case of stations of greater than 500 watts of power.

5. That advertising efforts via the broadcast be confined to the providing of meritorious programs which build goodwill for the sponsor.

6. That in issuing licenses, the Department uses discrimination looking toward the location of all broadcasting stations outside of congested centers.

7. That Congress be requested to enact new radio legislation vesting the administration of radio in the Secretary of Commerce, subject to approval of an appropriate court.

With the unanimous adoption of the many reports and resolutions at this conference, the radio industry at last came to the realization that a new law was a pressing necessity and new legislation must be prepared as the next big effort by Congressman White, and as was indicated by the report of Hoover's committee on legislation, could now receive unanimous affirmative consideration.

Fourteen years of haphazard growth come to an end

Without a change in radio legislation in 14 years, especially since the end of World War I, Herbert Hoover had been in control and guided the radio developments as Secretary of the Department of Commerce. These were chaotic years for radio. The radio amateur was in the forefront of practically all major progress made in radio, especially with the support and cooperation of the Commerce Department.

With radio neglected by Congressmen, and court cases looming on the horizon, Herbert Hoover was now willing to surrender further attempts at assigning wavelengths and regulating times of operation and power of stations. He was ready to renounce the absolute control of broadcasting. 73

Say you saw it in *73!*

Above & Beyond

continued from page 43

not bad for my construction. Equivalent to about 1.5 to 1 SWR.

I mentioned using SCHD 40 PVC pipe and fittings to construct a mount and a protective cover. Testing the PVC SCHD 40 pipe, it proved unworthy of RF operation as it detuned the slot very bad. I then came across a fluorescent light plastic clear shield that is used to slip over fluorescent tubes of 4-foot length and it matched exactly the 1-1/4 inch PVC SCHD 40 fittings. Testing the clear fluorescent tubing it proved to have no effect when held near the slot, making a good lightweight cover.

I drilled holes for condensed water to evaporate out of the bottom of the PVC pipe cap when the coax connector was also attached. The SCHD 40 fittings used were an inch and one quarter "T", a 90 degree elbow, and two end caps. A length of SCHD 40 pipe 10 feet long was secured to serve as a test mount pole. Two short sections of pipe are needed to fit the end cap and elbow to the "T" fitting. Cut the length of fluorescent clear tubing to fit the dimensions. I used a small piece of cardboard to fit the brass tubing in the center of the clear tubing for rigidity, to prevent rattling around inside the clear tube.

The brass tube use was inch and one quarter brass with a fifty-thousandths-thick wall. The slot cut into the brass tube is approximately 0.156 inch wide and was cut 20-3/4 inches long. The actual slot was reduced with soldered copper straps to eight inches for best operation.

The slot antenna is quite forgiving, as Kerry N6IZW positioned his slot slightly different from mine and his worked just as well. I chose to space the feed in the center of the excessively long slot and tune from both ends with adjustable shorting straps. This, versus moving the feed to accommodate tuning adjustments. Both antennas work well and are used for the Microwave Net held every Monday evening on 1296.4 MHz, and the Palomar Club Repeater 146.73, at 9 p.m. every Monday except the 3rd Monday of the month. That's reserved for informal meetings at N6IZW's QTH at 7 p.m. The net is open forum for microwave activities for all interested amateurs to check in.

About SCHD 40 PVC pipe

The pipe OD is 1.665 inches and its ID is 1.470 inches. Why, then, do they call it "inch and one quarter" PVC pipe? Trust me, it's printed right on the fitting, inch and one quarter! Never figured that question out. The clear plastic fluorescent tube covering is 1.660 inches OD — neat, the dimension worked out for the PVC end caps. Call lighting retailers, especially commercial fluorescent light dealers, and ask for fluorescent light shields called "Tube Guards." They usually accompany a rotating black printed mesh to allow adjusting the light brightness on desk cabinet lights for commercial applications. You only want the clear cover, and it's very inexpensive — about $3 for a 4-foot section.

Well, that's it for this time. I hope you have found another item to add to your antenna farm, as well as the methods to test it. 73, Chuck WB6IGP. 73

Homing In

continued from page 46

receiver. It could also be adapted to other VHF sets that are based on the MC3362 monolithic receiver IC.

In the "Homing In" write-up, I mistakenly gave KK5YY sole credit for developing the tuner circuit. Actually, it was a joint project of Jerry Boyd WB8WFK and Mike Pendley K5ATM from nearby Albuquerque. They couldn't go to Dayton this year, so KK5YY gave the presentation.

Several radio-orienteers from Albuquerque used prototypes of this tuner at the 2002 USA ARDF Championships in April (**Photo F**). Jerry and Mike are still perfecting their PIC software and arranging for a circuit board, so the project isn't quite ready for publication. In the meantime, you can contact them directly for more information.

That's all for this month, except for a reminder to do some monitoring for those endangered Burrowing Owls if you live in western states. Their fall migration will be nearing completion as you receive this issue, but the tag transmitters will be active for another month or two. All the frequencies and information on the project are at my Web site. The URL is at the beginning of this article. 73

On the Go

continued from page 47

eventually broken. Frequently this is accomplished by running one end of the antenna to a rope with the rope running through a pulley and the end tied to a weight. In wind the antenna can pull the weight up to relieve stress rather than placing the stress on

the antenna wire itself. Also, given the fact that the high plains do not have a lot of trees, and my antennas will be in the open, lightning protection will be more of a concern than I have faced in the past.

5. Opportunities for training and service - The most important part of the equation in amateur radio is the skills of the operator, and all of us must practice to keep our skills current. There is a very active ARES/RACES operation in this area as well as a lot of public service support. This presents an excellent opportunity to get used to the operating practices in the area as well as brush off some cobwebs. I surprise myself at times when I check into a net and realize that I'm just a bit rusty at some of the procedures. It happens to everyone — part of amateur radio being an art as well as a science.

6. Mobile opportunities — Cheyenne is not a large metropolitan area. One of the local jokes is that if you're late for a meeting when you leave the house you'll be on time when you get there. Every place I've gone has taken less than twenty minutes, so far. As such, there isn't going to be a lot of radio time on the way to and from work. Since the wife got a new(er) car, I have her hand-me-down and need to figure out how I'm going to configure it. My current plan is to have the standard 2-meter/440 MHz and 10-meter FM. This will give me some HF capabilities without taking up a lot of room and with a short enough antenna to clear the parking garage. Ten-meter repeaters are good for short QSOs with worldwide coverage, so it presents an excellent compromise.

7. Now, I know I'm forgetting something. The good news is that by the time you read this I'll have figured it out (I hope). In the meantime, if you'll excuse me, I have to pack. 73

The Digital Port

continued from page 52

URL for the Web site is published here, but if you do not have that available or are unfamiliar with the use of your browser, the use of a search by any of the services that use Google as their search engine can save a lot of frustration. I felt very fortunate that either a search for KB7NO or *The Infamous Chart* came back with our Web site at the top of the list. Mission accomplished! Now I just need to clean it up and make all those added attractions.

Speaking of search results, I was a little surprised when I came across a pleasant mention from a reader of this column in a brief testimonial on the RigBlaster Web site. What caught my notice was the content where the user mentioned having been an inactive ham for a period of years, that he had read this column and was motivated to invest in the interface and start enjoying ham radio again. This is happening a lot these days. Digital modes have excited a lot of hams to dust off the equipment and rediscover ham radio. As I like to say, there ain't nothing so exciting to be found on TV.

Related computer experience

For several years, I have fought off the notion that I should install Netscape 6.2. The reasons were that it ran poorly on a slow computer and the screen was crowded with many frames and difficult to read on a small monitor. Good reasons, but somehow I got backed into a corner when I allowed too much space to be taken up with the junk mail attack from folks who were promising to make me rich and famous since I have a Web site.

Old faithful Netscape 4.7 finally bit the dust and I was fortunate, it seemed, to do a reinstall and get the browser portion working well enough to go in search of a program to do mail. I didn't find what I was looking for in the readily available mail software, so downloaded the Netscape 6.2 and this faster computer with a 19" monitor is adequate to handle the chores comfortably.

However, as I looked at all the excess space-consuming bells and whistles, I realized this is definitely not for a small monitor even if you have the resources to run the package. On the other hand, I was pleasantly surprised with the added speed of file downloading and handling. Also I noticed the KB7NO Web site takes on a slightly different skew, nothing really problematic, but it is different. Of course, really different and something to always check with is the difference when viewing with Internet Explorer. I already found at least one instance where a layout appears just fine when viewed with Internet Explorer and is totally wrong with Netscape.

I am not sure how I drifted from Netscape to Web site appearances. Can you imagine this line of thinking 20 years ago? Life is just too complicated for us ordinary hams these days.

Enough for now. You guys (and gals) are doing a great job occupying the airwaves with this digital stuff. Give me a shout if I can help at [KB7NO@att.net]. 73, Jack KB7NO. 73

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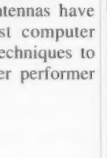

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QRP

continued from page 53

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Depending on how you build your amplifier, you can have either a 50-watt version or a 100-watt version. The choice is yours. The only difference is in the transistors used.

This little project generated a lot of interest. Not so much as an amplifier for a QRP radio, but as a nifty home-brew project! If it were not for that pesky FCC rule about selling amplifier kits, old Bob could have sold all that he could have brought.

And having said just that, there are NO kits to this project. I would suggest you stop by Bob's Web site at [http://www.geocities.com/refriess/N6CM.html], and see the project close up.

So, as you can see, there was quite a lot of slick new stuff for the QRP operator introduced this year. Of course, many of the new items were not mentioned here due to space limitations. Perhaps down the road, we'll highlight those that we missed in this issue. 73

Letters

continued from page 8

Communications Service, PARTICULARLY WITH RESPECT TO PROVIDING EMERGENCY COMMUNICATIONS." Now look up the word "subvert," and next the word "emergency."

Any questions? I agree with Steve: "I'm sorry, but I don't think anyone's normal business includes a disaster or an attack. … We need to have and project the idea that we are ready, willing, and able to do whatever is necessary to help out our community in times of emergency."

I couldn't agree more. 73

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Never Say Die

continued from page 40

getting some invitations to give telephone talks to ham clubs. The talks are working out great. They're fun for me and draw good crowds for the clubs.

After doing this a couple of times I can see where I need to be better organized. I have so many things that I know will interest everyone that I tend to try to cover too much ground in an hour.

In the ham radio field I like to explain the real story of what's been called Incentive Licensing — how it came about, what was intended, and the unintended short- and long-range consequences.

Okay, so amateur radio's growth has come to a halt. And at a time when the pressure is on by any number of new services seriously in need of spectrum space. Are we just going to fade away, or is there some way we can get the hobby kick-started?

Then there's the lifetime of excitement and adventure that amateur radio has provided me. Like the King Hussein story and the around-the-world Operation World Wide flight where we visited hams in 26 countries and made thousands of 20 SSB contacts from the plane as we flew.

The breakthrough in health is too exciting for me not to bring it up.

My thanks to the Sheboygan County club for being good listeners and coming up with good questions.

Double Teeth

Writer Brad Steiger, on a recent Art Bell Show, mentioned that skulls of giants had been dug up in Ohio that had double rows of teeth and horns. More forbidden archeology stuff, hidden away on a university's back shelves somewhere. A letter from reader William Bradford says that when he was cleaning the clay off some Ohio skulls he came across a whole group of supposed Indian skulls which had double rows of teeth, but no giants and no horns.

When a new road is being built they scrape off the top layer of dirt. If any remains are found a state university is given a short time to dig and assess the site.

Wait'll you read Michael Cremo's *Forbidden Archeology* and find out how much stuff our archeology establishment has been hiding from us. It's reviewed on page 33 of my *Wisdom Guide*.

Faceless

In thinking back, I don't recall one teacher during my 16 years in school who ever showed the slightest interest in me as a person. I was just another student

to all of them, from kindergarten through college. One more soon forgotten face. Thinking back, the result of this was that I didn't have much of a feeling of personal identity. I was just another kid as far as I knew.

It really wasn't until I got interested in amateur radio that I began to feel that I was different ... that I had something special going for me that the other kids didn't. I particularly enjoyed building hi-fi equipment and ham gear. I spent years at the work bench and loved every minute of it. That's why, when I started *73* in 1960, I did everything I could to encourage readers to get interested in building.

But that was back in the tube days ... in the days of war surplus equipment we could modify for the ham bands. Back before transistors and ICs. We had little tiny VHF tubes and huge transmitting power tubes. We had peanut tubes and acorn tubes. And we had a ball.

We had Poly Paks for cheap parts. We had nearly a thousand ham stores around the country, many with big tables of cheap parts. We had Cardwell, Thordarson, Stancor, Johnson, Millen, Bud, Bliley, and so on making parts.

Old-timers will remember when we builders made fun of "appliance operators." Now we're all appliance operators, only now we need a ten-week course in how to use our appliance rigs ... and a quick brush-up session when we're away from the rig for a coffee break.

Still, even today, we all feel we are different from everyone else. We're ham operators.

Hot Potato

"Every time we do something you (Shimon Perez) tell me America will do this and will do that. I want to tell you something very clear. Don't worry about American pressure on Israel. We, the Jewish people, control America and the Americans know it." Ariel Sharon, Israeli Prime Minister, Israel Radio, Tel Aviv, October 3, 2001 [http://geocities.com/vialls2/index.html].

Hmm — do Americans really know that, as he said? Or is this just some more E-E-mail disinformation?

My Advice

With Bush rushing us toward what is hoped to be a warlette with Iraq, I wish he'd asked me for my advice before acting. Yes, I understand about Saddam and his weapons of mass destruction. Heck, I've been writing about that menace for several years.

But how about this approach? In the past the UN sent inspection teams to investigate potential weapons factories, only to have the Iraqis bar them from inspecting some plants. This time, instead of committing fifty or a hundred thousand troops, how about the inspection teams, when they are refused access to a building, calling in a pin-point air strike to blow the place to smithereens? Along about the second or third time we did this I suspect the UN teams would stop being refused access anywhere.

We could also offer relocation for anyone (and their family) to anywhere in the world they want for information leading us to find a weapons plant we didn't know about.

Weather Modification

The scientific establishment has a long, unbroken, history of resisting new ideas and developments. I won't go into the all-too-well-known details of Semmelwise trying to get doctors to wash their hands, the invention of the stethoscope, Galileo, the Wright Brothers, and so on. We've seen this arrogance up close recently with cold fusion, and before that with quantum physics.

The scientific community still has the fire brands at hand to burn anyone at the stake who is silly enough to try to investigate pseudo-science, a.k.a., the paranormal. Like ESP, precognition, psychometry, telepathy, near-death experiences, out-of-body experiences, remote viewing, prophecy, and so on. When it comes to researching UFOs, ET experiences, contactees, and crop patterns, they first tar and feather these crazies and then burn them. It makes a brighter, longer lasting fire.

Warm up the tar, guys. Well, I'm a known "crazy." In 1970 when I predicted that our ham repeater systems would one day lead to millions of people using such a service, I got the big heehaw. So I started my *Repeater Journal* and made it happen. In 1975, shortly after the first microcomputer was introduced I predicted in my editorials that they would, in a few years be one of the largest industries in the world. The computer industry giants were the loudest laughers. Those things were just toys. So I started *Byte*.

For those readers with short attention spans, let me remind you of Neil Slade's little exercise in cloud manipulation. I love amazing people with the power of my mighty mind by pointing to a couple clouds and telling 'em that I'm going to make the second one disappear. They naturally laugh at such a ridiculous idea. So I get them in a conversation about something for a couple of minutes, and then ask them to look up. Sure enough, only one cloud is left. Hey, it doesn't take any special brainpower to manipulate clouds, anyone can do it.

Okay, so what might happen if a thousand people were to do this all at once? A million?

Well, Art Bell (W6OBB), on his nightly talk show, asked the audience to concentrate on making it rain in Texas at a time when fires were burning all around the state. Within hours Texas was awash in rain, even though the weather bureau had none predicted.

Art repeated this a few days later when Florida was in flames, and the state almost got washed into the ocean. Art, not sure what he was getting into, stopped messing with weather modification.

Continued on page 61

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No Good Days — From a Forecast Standpoint

For many hams this is the prime DXing season, but sharp skills will be needed to cope with conditions this month. Solar activity is forecast to be at moderate to high levels, punctuated by short periods of intense behavior much of the time. There are no Good (G) days marked on the calendar this time, which is a complete reversal of last month's trend. However, positive seasonal influences could tip otherwise marginal days in our favor, so good opportunities may arise when not expected.

As conditions permit, ten and twelve meters should be very active with strong signals during daylight hours. They will close earlier each day as winter approaches, but fifteen meters should remain open well into the evening. Twenty will be your mainstay, as usual, and should be workable around the clock. Thirty and forty meters will be very good after sunset and are likely to become crowded when conditions are favorable. Eighty meters could be interesting but signals will be weak, so you'll need a good antenna and some transmitter power to be successful.

A review of your old November logs from the last solar cycle might serve as a very good operating template, so dig them out if you haven't discarded them. So far, the sunspot numbers that have been observed this year are quite similar to those plotted for the peak years of Cycle 22 (mid-1989 through late 1992), when the monthly "smoothed" averages remained well above 100. I don't anticipate much of a deviation from the operating conditions we saw ten years ago, so let history be your guide.

Getting to the meat of our forecast, there are four lengthy periods in November that will be mostly Poor (P) or Fair-to-Poor (F-P), especially for those living in northerly climes. Conditions may improve slightly for a few days in between these "clunkers," but it looks as if weak and spotty signals can be expected much of the time. Look for CMEs and strong flaring on the Poor (P) days, especially around the 3rd, 11th, 17th, and 28th, and remember that anytime these events are Earth-directed we may experience geomagnetic storms a day or two afterward.

Putting a positive spin on this, late autumn is a good season for viewing auroral displays during the midnight hours. If you live up north and are in an area without much light pollution, there could

November 2002

SUN	MON	TUE	WED	THU	FRI	SAT
					1 P	2 P
3 P	4 F-P	5 F	6 F-G	7 F-G	8 F	9 F-P
10 F-P	11 P	12 P	13 F-P	14 F	15 F-G	16 F-P
17 P	18 P	19 F-P	20 F	21 F	22 F-G	23 F-P
24 F	25 F-P	26 F	27 F-P	28 P	29 F-P	30 F-G

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15 (40)	20 (40)	20 (40)	(40)	(40)	(20-40)	(15) 20	10-20	10 (20)	10-17	10 (20)	(10) 20
South America	(15) 20	20 (40)	20 (40)	20 (40)	x	x	(15-20)	x	(10)	10 (15)	10 (20)	(10) 20
Western Europe	40	40	40	40	(40)	x	(10-20)	10 (20)	(10) 20	(15-20)	(20)	(20-40)
Southern Africa	(20-40)	(40)	x	x	x	x	x	(10-12)	10 (17)	(12) 17	(15-20)	20
Eastern Europe	(40)	(40)	x	x	(20)	x	(10-20)	(10) 20	(20)	x	x	x
Middle East	(40)	(40)	x	x	x	x	(10)	(10-15)	15 (20)	20	(20)	(20)
India/ Pakistan	x	x	x	x	x	x	x	(15-20)	x	x	x	(20)
Far East/ Japan	(15) 20	20	(20)	(20)	x	x	(20)	x	x	x	x	(10-20)
Southeast Asia	(15-20)	x	x	x	x	x	x	(10-20)	(10-15)	x	x	x
Australia	(10-17)	(15-20)	x	x	(20)	(30-40)	(20-40)	(10) 20	(10-20)	x	(20)	(10-15)
Alaska	15-17	20-30	x	x	x	20-30	20-30	15-17	15-17	x	x	15-17
Hawaii	(10) 15	(20)	20	(20)	20 (40)	40	(20-40)	(20)	(15-20)	x	(10)	10 (15)
Western USA	(10) 40	(15) 40	20-40	(20) 40	40	40	40	(20-40)	(10-20)	10-20	10-20	10-20

CENTRAL UNITED STATES TO:

Central America	(15) 20	20 (40)	(20) 40	(20) 40	(20) 40	40	(40)	(10) 20	10-20	10-15	10 (20)	15-20
South America	(15) 20	20	20 (40)	20 (40)	(20)	x	x	x	(10)	10	10(20)	(10) 20
Western Europe	(40)	40	40	(40)	x	x	(20)	(15) 20	(10) 15	(15) 20	(20)	x
Southern Africa	20	(20)	x	x	x	x	x	x	(10-15)	(10) 15	15 (20)	20
Eastern Europe	x	(40)	x	x	x	x	x	(10) 20	(10-20)	x	x	x
Middle East	x	(40)	(20)	(20)	x	x	x	(10-15)	(10-15)	(20)	20	(20)
India/ Pakistan	x	(15)	x	x	x	x	(20)	x	(15)	x	x	x
Far East/ Japan	x	x	(20)	20	(20-40)	(40)	(20)	20	(15-20)	x	15	(15)
Southeast Asia	x	x	x	x	(20)	(20)	20	(15-20)	(15)	x	(15)	x
Australia	(10) 15	15	(15-20)	20	20 (40)	20-40	20 (40)	(20)	x	x	x	(10-15)
Alaska	15-17	15-17	x	x	x	(40)	(40)	20	20	x	x	x
Hawaii	(10) 15	(15-20)	20	20	(40)	(20-40)	20 (40)	x	(15)	(15)	(15)	(10) 15

WESTERN UNITED STATES TO:

Central America	(20-40)	40	40	40	(40)	x	(20)	(10) 20	10 (20)	10 (20)	(10) 20	(15) 20
South America	17 (40)	(20)	x	x	x	x	x	(15)	12 (20)	10-20	10-20	12 (40)
Western Europe	x	x	(40)	(20)	(20)	x	(20)	(10-20)	(10) 20	(20)	x	x
Southern Africa	(20)	x	x	x	x	x	x	x	(10)	(15)	15 (20)	(15) 20
Eastern Europe	x	x	x	x	x	x	x	x	x	x	x	x
Middle East	(20)	(40)	(20)	20	20	(20)	x	(15)	(10) 15	(10-15)	(20)	(20)
India/ Pakistan	(15-20)	x	x	x	x	x	(20)	x	x	x	x	x
Far East/ Japan	(10) 20	(15-20)	x	x	(40)	40	(40)	x	x	x	(10-20)	10-20
Southeast Asia	(15)	(20)	x	x	x	x	x	(20)	(15) 20	(20)	(10-15)	10-15
Australia	(10-15)	(15-20)	x	x	x	(20-40)	(20-40)	20	(15-20)	15	(10-15)	10
Alaska	10-15	x	x	20-30	20-30	20-30	20-40	x	20	15	x	15-17
Hawaii	(15) 20	(15) 20	20	(20)	(40)	40	(20-40)	(15) 20	15 (20)	(10-15)	10 (15)	(10) 15
Eastern USA	(10) 40	(15) 40	20-40	(20) 40	40	40	(20-40)	(10-20)	10-20	10-20	10-20	10-20

Table 1. *Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.*

be a good show going on overhead whenever the sky is clear and the bands have gone dead. I look forward to major solar disturbances at this time of year and never miss an opportunity to see the awesome "ballet of light" that can be triggered by them, even if it means missing a bit of sleep. You can check on the aurora forecast by going to [http://www.space.com/spacewatch/space_weather.html#aurora] on the Internet. Another Web site that generates nice aurora forecast maps for your geographic location can be found at [http://www.gi.alaska.edu/aurora_predict/worldmap4.html].

Have fun, and Happy Thanksgiving!

Band-by-Band Summary

10 and 12 meters

Most of the world should be workable during daylight hours but the window of opportunity is narrowing as days become shorter. As usual, start working to the east just after sunrise and finish in the west about an hour after sunset. The morning and evening gray-lines can yield some interesting contacts, but remember that both you and the station at the other end of the "pipeline" must be in daylight and there isn't a large time window to work with. Daytime short-skip will range from around 1,000 to nearly 2,300 miles.

15 and 17 meters

Excellent worldwide openings can be found when propagation conditions are favorable but the strongest paths will lead to stations in the southern hemisphere. Europe can be worked before noon if the aurora doesn't interfere, but most southerly stations will be beyond reach up until after lunchtime. The best signals will come from Central and South America, but openings can be found from Africa to the South Pacific. Short-skip will average from 1,000 to 2,200 miles.

20 meters

Good DX will be available at nearly all hours when solar activity isn't too disruptive. Peak periods will fall a couple of hours after sunrise and again in the late afternoon and early evening. Africa, the northern half of South America, and the South Pacific should all be fairly easy to work at this time of year. Also, try long paths across the Antarctic in the morning for activity in Southern Asia and the Near East. Short-skip can range from 500 miles during the day up to 2,100 miles at night.

30 and 40 meters

Good worldwide opportunities can be found during the hours of darkness, particularly into the southern hemisphere. Central and South America will have the strongest signals but Southern Europe, the Middle East, and the South Pacific will also provide some good opportunities. Operators on the west coast will probably have trouble with Europe but should hear the South Pacific, Australia, and Indonesia more often than those on the eastern seaboard. Skip distances can be from 750 miles to over 2000 miles at night but are limited to less than 1,000 miles during the day.

80 and 160 meters

These bands are now in season with fairly good worldwide DXing available to experienced DXers from sunset through sunrise. Sunspot activity will weaken signals however, so a good antenna and a bit of power will probably be required. Otherwise, stick to stateside phone operations. Expect skip to vary from less than 1,000 miles to over 2,000 miles at night. 73

NEVER SAY DIE

continued from page 59

Hmm, maybe the Indians weren't so crazy with their rain dances.

I do wish that Art had helped put out the Colorado fires by getting his audience to pray for rain there. In light of the Texas and Florida overkill, maybe asking just a few listeners to pray for rain could have done the job. This needs some research.

The next time there's a drought somewhere, instead of cursing God for the blight, maybe try some coordinated prayer to solve the situation.

Once we get the hang of this we'll be able to provide rain when and where it's needed. We'll be able to harness hurricanes and tornadoes. Hey, we have the power, we've just never bothered to learn how to harness and use it. Aspen and other ski areas will be able to get the right amount of snow every night to keep the trails fun to use.

All we have to do is get in better communication with Gaia and our mass consciousness.

If you're interested in reading more about this stuff, get started with Neil Slade, Dean Radin, Rupert Sheldrake, Eugene Maurey, Scott Adams, my *Dowsing* book, Chris Bird, and other authors reviewed in my *Secret Guide to Wisdom*.

The so-called bliss of ignorance is a fools' paradise, and a signal for others to take advantage of you. Ignorance is for the suckers, so start reading. You could do worse than start with my books.

Thoughts

(1) We don't lose our health, we throw it away. Hey, what's one cup of coffee hurt? One teaspoon of sugar? Do you recall ever hearing anything about how to keep your body healthy during your years in school? Our media is consumed with sickness, not health. As they say, "Good news does not sell papers."

(2) Both in life and business we're busy every day making decisions and solving problems. Our schools teach neither of these critical skills. Most decisions are minor, but every now and then we're faced with the need to make a decision that could well change our lives. When those times come, will we make our decisions on the basis of bad data, or, even worse, on an emotional response?

Our brains, like computers, come in various strengths and speeds — a good deal dependent on how well nourished they are during the first few years, when most of the potential growth occurs. Nourished, not just with nutrients, but with exercise during critical growth periods.

Alas, virtually no parents have taken advantage of the research that's been reported in baby and childhood brain development — research that explains how any interested parents can increase their child's IQ by 40 to 50 points. I'm talking almost every child a potential Mensa member in the 2% IQ range.

Quotes

I keep a few inspirational quotes posted around my office.

Like one from Margaret Mead, "Never doubt that a small group of committed individuals can change the world. Indeed, it's the only thing that ever has."

Then there's George Bernard Shaw: "The reasonable man adapts himself to the world, the unreasonable man persists in trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man."

Prisons

How come John Stossel hasn't done one of his "Give Me A Break" pieces on the American prison situation? I'm, of course, referring to the two million people we have locked up at an average cost, according to a recent news broadcast, of $60,000 each. Hmm, that's $120 billion (with a B) out of our pockets every year, a thousand dollars a family, mostly to keep the cost of drugs high on the street. Well, I guess we don't

seriously want to mess with a trillion-dollar industry.

Any congressman who even hinted at legitimizing drugs would first take a big hit in his re-election campaign funding, and then, if he persisted, might find he and his family the target of a more serious hit.

By the time you add up the bribes to police, the feds, customs agents, BATF agents, and other officials, plus payoffs to politicians and bureaucrats at almost every level, plus the cost of running 1,578 prisons, this is quite an industry.

So let's sock away the million street-level jerks who've gotten caught selling the stuff and didn't have enough money to either bribe their way out or get a good enough lawyer to beat the system. Let's put 'em in prison, a.k.a. crime university, so by the time they get out they'll be better educated criminals.

When we finally decriminalized alcohol we ruined business for a million criminals. The big guys did just fine by switching over to importing drugs instead of rum-running.

Let me know when you think it might be time for an education program about alcohol. Ooops, that's another trillion dollar industry which mustn't be messed with. We don't want to kill beer sales, or put a million bars and liquor stores out of business, do we? Well, you probably don't, but I do.

Danger!

Didja read about the CDC research report which says that one out of nine people who receive hospital care is seriously sickened or injured? Look on the bright side, eight out of nine people don't get seriously sickened or injured — only a little sickened or injured. And that doesn't count what the hospital food does to them.

Okinawa

How come Okinawans have one fourth as many cancers as Americans? The same reason they're living five years longer than we are. Diet. Less sugar and a lot more tofu — more than 10 times as much tofu. We're drinking over ten times as much milk. Oh, have you read Robert Cohen's *Milk, The Deadly Poison*? I've reviewed it in an editorial essay and it's also in my *Secret Guide to Wisdom*.

Hey, if a slow, very painful, hugely expensive cancer death and a shorter life don't worry you, never mind. I'm paying attention because, at 80, I've got at least another twenty years' work laid out. And that's in addition to trying to get the word out on the truth about health to a seemingly deaf, dumb, and blind population.

College Grads

Okay, you are now "formally educated." But that doesn't mean you've learned much of practical value to your career. Or, have you really had a career in mind? Or have you just been going with the flow?

Your college teachers, with very few exceptions, are people who've never worked in the business world. They've forced you to memorize the same stuff for quizzes that they had to memorize when they went to college. Stuff out of pretty much the same textbooks.

With the job market for grads in the pits these days, just sending out résumés, no matter how creative and exaggerated they are, isn't working.

The free ride on your parents is over. Or, worse, you've gone thousands of dollars in hock to get that degree. Either way, you're now expected to enter the job market and start making money on your own.

It's almost time to start giving some thought to building a career. So, what's it going to be? You're now facing one of the most important choices in your life. One that you postponed four years earlier when you opted for college. Now, you have to make a major choice. Will it be a job? Or back to school for an advanced degree, putting off that career decision again?

If you keep doing this, you'll end up a professor with students short-term-memorizing the same stuff for quizzes that you did.

Monopoly Mail

Congress didn't do us any favors when it set up the U.S. Postal Service as a monopoly. They made it illegal to compete with it. And what a franchise it has, with the exemption from taxes, zoning laws, and vehicle license requirements. It admits that it has 26,000 offices that are not making money, but any attempt to close them or to downsize their enormous workforce is vigorously fought by Congress.

Many other countries have seen the light, recognizing that socialism doesn't work, and are privatizing their post offices. New Zealand has closed more than a third of their post offices and is privatizing the system. So are Sweden, Finland, Australia, and the Netherlands.

It is illegal for a private company to put anything into a customer's mailbox or through the mail slot in their home. It is illegal to consolidate mail, such as sending bills from several companies in one envelope. Some of our ham radio QSL bureaus have gotten into trouble with the feds because their consolidating of QSL cards is an illegal activity.

Because the Postal Service faces no competition there is little incentive to control costs or maintain quality. It is able to overpay its bureaucracy in salary, benefits, and perks. There is no pressure to minimize waste. The bureaucracy has fought every effort to introduce new technologies to speed up and cut the cost of services. Why, that would put some workers out of work! Thus mail delivery is slow, unreliable, and even lost. I've found that about 2% of the books I mail to customers never arrive! They just disappear. When I mailed silver wire for making silver colloid to nearly 500 customers only about 5% of them ever got it. That bit of postal theft cost me over $5,000.

A study by the Postal Service found that on routes where private carriers had been contracted, the costs were half those of the Postal Service carriers.

According to the Postal Rate Commissioner, "U.S. Postal workers are the highest paid semiskilled workers in the world." Including overtime and benefits, they're getting an average of over $45,000 per worker.

A postal audit showed that they damaged half the packages marked "Fragile" that they carried. 94,000 letters were found buried in the back yard of one carrier. Doubleday did a survey and found that 14% of their properly addressed third class mail vanished in the postal system. A Postal Inspection Service audit found properly addressed mail dumped in the trash in 76% of the offices they inspected.

We've gone during my memory from two home deliveries on weekdays and one on Saturday to one on weekdays, and from 2¢ for a letter to 37¢. Now they're planning on ending home deliveries. And yet the service has always lost money, with the shortfall (subsidy) provided by the government — which means that we all are paying for it, one way or another — whether we use it or not.

If you're interested in the skinny on the situation, invest $13 in the Cato Institute book, *Free the Mail*. Get their free book catalog anyway. 224 2nd Street S.E., Washington DC 20003. If you want a second opinion, then check out *Monopoly Mail* by Douglas Adie, also from Cato.

How It Works

In a world where almost nothing is as it is made to appear, it should not surprise you to learn that lobbyists are paying off our senators and representatives with cash, trips to "conferences" in prime vacation areas, and so on. And that the same thing is going on in the medical

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). $10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. $5 (#02)

The Blood Purifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean your blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. It's working miracles! $10 (#01)

Plant Growth Stimulator: This has the same circuit as the above, all ready to use. Many customers are buying second and third units for their family. Postpaid: $155 (#PGS).

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. $5 (#10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. $0 (78)

Wayne's Caribbean Adventures: My super budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out is right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? $5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. $5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. $3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. $40 (#52)

Reprints of My Editorials from *73*. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system,. our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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1998 192 Editorial Essays: $10 (#75)
1999 165 Editorial Essays: $8 (#76)
2000 101 Editorial Essays: $5 (#77)
2001 104 Editorial Essays: $5 (#78)

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Colloid Reprint. April '97 article on a silver colloid maker, history, and how to use the stuff. $5 (#98).

Colloid Clips. Three 9V battery clips, 2 aligator clips & instructions. $5 (#99).

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. $37 (#82)

Four Small Booklets Combo: $3 (#86). Super Organic Food: a trillion dollar new industry; Schools in 2020: another $ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works.

My 1992 **We The People Declare War! On Our Lousy Government** book–360 pages and packed with ideas that'll get you all excited. Was $13. While they last $10. Just a few left, found in the warehouse. Last chance for this classic.(#06)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. $25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was $7. I found a few in the warehouse. $3, while they last. Great book! (#83)

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost) — comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the January 2003 classified ad section is November 10, 2002.

220 MHz Award; see W9CYT on WWW.QRZ.COM for information. BNB645

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NEVER SAY DIE

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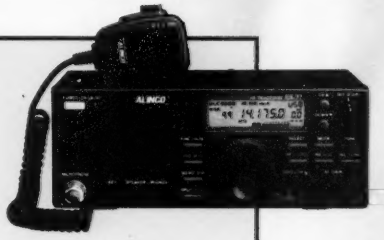

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